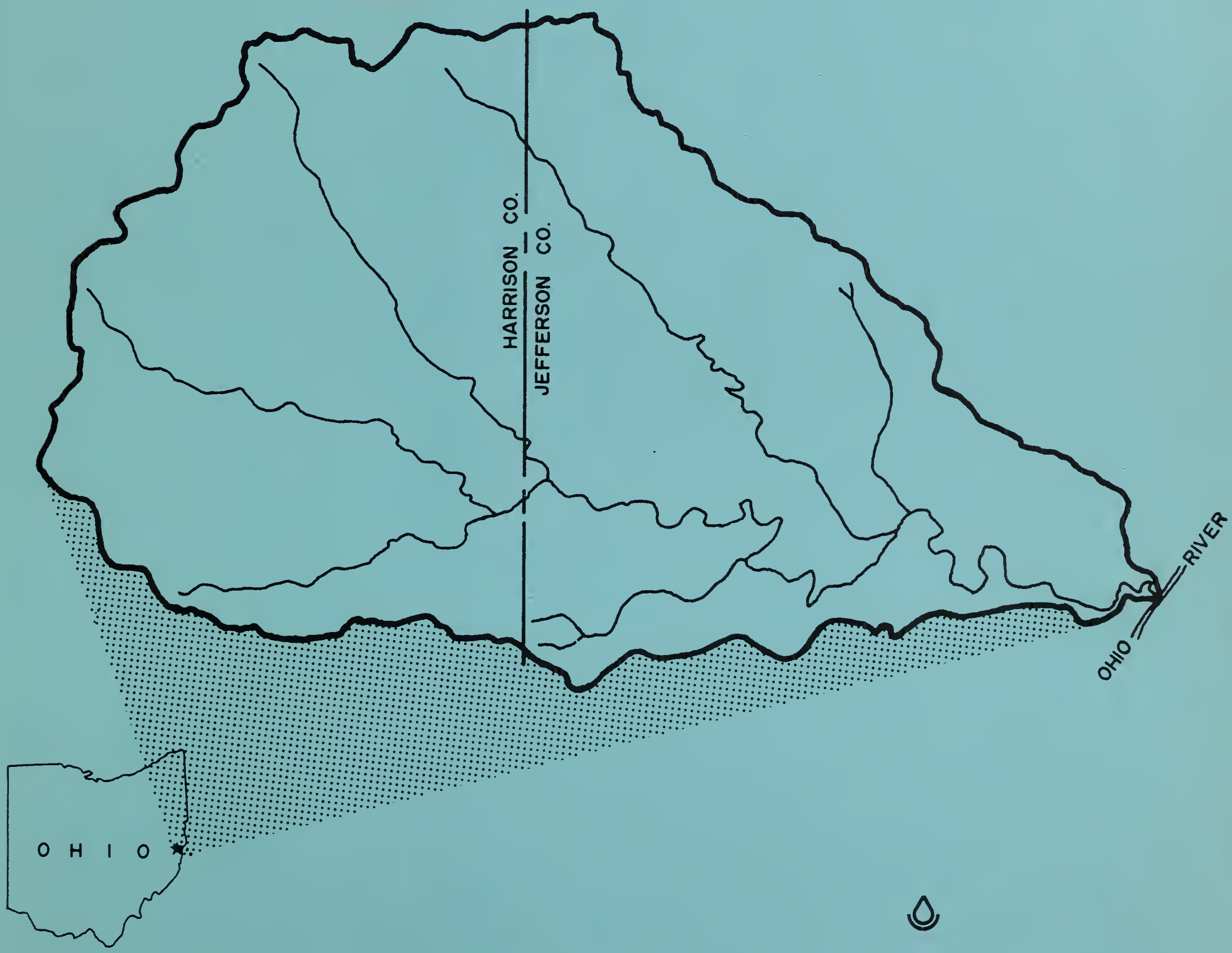
FINAL PLAN
AND
FINAL ENVIRONMENTAL IMPACT STATEMENT
SHORT CREEK WATERSHED



UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Columbus, Ohio

April, 1976

PLAN
and
FINAL ENVIRONMENTAL IMPACT STATEMENT

SHORT CREEK WATERSHED
Harrison and Jefferson Counties, Ohio

Prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat., 666), as amended and in accordance with the National Environmental Policy Act of 1969, Public Law 190, 91st Congress 83 Stat. 853, Section 102(2)(C).

Prepared by:

Short Creek Watershed Conservancy District
Dillonvale Village Council
Adena Village Council
Harrison Soil and Water Conservation District
Jefferson Soil and Water Conservation District
Jefferson County Board of Commissioners

Assisted by:

U.S. Soil Conservation Service
U.S. Forest Service

April 1976

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ACKNOWLEDGEMENTS

Agencies listed below provided reports or other assistance during the development of this Plan:

United States Army Corps of Engineers
United States Department of Commerce,
   National Weather Service
United States Department of the Interior,
   Fish and Wildlife Service
   Geological Survey
United States Environmental Protection Agency
Ohio Department of Health
Ohio Department of Natural Resources,
   Division of Forestry and Reclamation
   Division of Wildlife
   Division of Planning
Ohio Historical Society
Jefferson Soil and Water Conservation Districts
Harrison Soil and Water Conservation Districts
Jefferson County Commissioners
Harrison County Historical Society

These and other public agencies, private groups, and individuals provided valuable services in the preparation of this plan. Their contributions are appreciated very much.

PART I

PLAN

SHORT CREEK WATERSHED
Harrison and Jefferson Counties, Ohio

SHORT CREEK

PLAN AGREEMENT

between the

SHORT CREEK WATERSHED CONSERVANCY DISTRICT
Local Organization

DILLONVALE VILLAGE COUNCIL
Local Organization

ADENA VILLAGE COUNCIL
Local Organization

HARRISON SOIL AND WATER CONSERVATION DISTRICT
Local Organization

JEFFERSON SOIL AND WATER CONSERVATION DISTRICT
Local Organization

JEFFERSON COUNTY BOARD OF COMMISSIONERS
Local Organization

(hereinafter referred to as the
Sponsoring Local Organization)

State of Ohio

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan of works of improvement for the Short Creek Watershed, State of Ohio, under Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress; Stat. 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as

amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the Short Creek Watershed, State of Ohio, hereinafter referred to as the plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture through the Service, hereby agree on the plan, and further agree that the works of improvement as set forth in said plan can be installed in about five years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the plan:

1. The Sponsoring Local Organization will acquire such land rights as will be needed in connection with the works of improvement. The percentages of costs to be borne by the Sponsoring Local Organization and the Service are as follows:

Works of Improvement	Sponsoring Local Organization (Percent)	Service (Percent)	Estimated Land Rights Cost (Dollars)
All Structural Measures	100	0	$454,300

2. The Sponsoring Local Organization assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation

Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat, 1894) effective as of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

	Sponsoring Local Organization (Percent)	Service (Percent)	Estimated Relocation Payment Cost (Dollars)
Relocation Payments	39.4	60.6	$83,510

3. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State Law as may be needed in the installation and operation of works of improment.

4. The percentage of construction cost of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

Works of Improvement	Sponsoring Local Organization (Percent)	Service (Percent)	Estimated Construction Cost (Dollars)
Floodwater Retarding Structure	0	100	$794,400
Channel Work	0	100	$2,675,400

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organization and the Service are as follows:

Works of Improvement	Sponsoring Local Organization (Percent)	Service (Percent)	Estimated Engineering Cost (Dollars)
Floodwater Retarding Structure	0	100	$62,000
Channel Work	0	100	$149,800

6. The Sponsoring Local Organization will administer contracts unless the Sponsors, at a later date, request the Soil Conservation Service to administer contracts. The Sponsoring Local Organization and the Service will each bear their cost for project administration, estimated at $87,510 and $599,000 respectively.

7. The Sponsoring Local Organization will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.

8. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the plan.

9. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

10. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

11. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

12. This agreement is not a fund obligating document. Financial and other assistance to

be furnished by the Service in carrying out the plan is contingent on the appropriations for this purpose.

A separate agreement will be entered into between the Service and the Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

13. The plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties.

    An amendment to incorporate changes affecting one specific structural measure may be made by mutual agreement between the Service and the Sponsor(s) having specific responsibilities for the particular structural measure involved.

14. No member of or delegate to congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

15. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving federal financial assistance.

SHORT CREEK WATERSHED CONSERVANCY DISTRICT
Local Organization

By Tiry Bellinky
Title Chairman

Steubenville, Ohio 43952
Address Zip Code

Date April 20, 1976

The signing of this agreement was authorized by a resolution of the governing body of the Short Creek Watershed Conservancy District
Local Organization

adopted at a meeting held on April 20, 1976

Joseph Charvat
Secretary, Local Organization

Dillonvale, Ohio 43917
Address Zip Code

Date 4/20/76

DILLONVALE VILLAGE COUNCIL
Local Organization

By Silvio Band
Title Mayor

Dillonvale, Ohio 43917
Address Zip Code

Date April 20, 1976

The signing of this agreement was authorized by a resolution of the governing body of the Dillonvale Village Council
Local Organization

adopted at a meeting held on April 13, 1976

Monica Iacanza
Secretary, Local Organization

Dillonvale, OHio 43917
Address Zip Code

Date April 20, 1976

ADENA VILLAGE COUNCIL
Local Organization

By James Sliva
Title Mayor

Adena, Ohio 43901
Address Zip Code

Date 4/27/76

The signing of this agreement was authorized by a resolution of the governing body of the Adena Village Council
Local Organization

adopted at a meeting held on April 27, 1976

Vincentia Maslocki
Secretary, Local Organization

Adena, Ohio 43901
Address Zip Code

Date 4-27-76

HARRISON SOIL AND WATER CONSERVATION DISTRICT
Local Organization

By Wood Thompson
Title Chairman

Cadiz, Ohio 43907
Address Zip Code

Date April 19, 1976

The signing of this agreement was authorized by a resolution of the governing body of the Harrison Soil and Water Conservation District

adopted at a meeting held on April 12, 1976

E H West
Secretary, Local Organization

Route #2, Tippecanoe, Ohio 44699
Address Zip Code

Date April 19, 1976

JEFFERSON SOIL AND WATER CONSERVATION DISTRICT
Local Organization

By [illegible]
Title chairman

Steubenville, Ohio 43952
Address Zip Code

Date April 19, 1976

The signing of this agreement was authorized by a resolution of the governing body of the Jefferson Soil and Water Conservation District

adopted at a meeting held on March 23, 1976

Pete Puskarich
Secretary, Local Organization

R. D. # 5, Cadiz, Ohio 43907
Address Zip Code

Date April 19, 1976

JEFFERSON COUNTY BOARD OF COMMISSIONERS
Local Organization

By [illegible]
Title COMMISSIONER

Steubenville, Ohio 43852
Address Zip Code

Date April 22nd, 1976

The signing of this agreement was authorized by a resolution of the governing body of the Jefferson County Board of Commissioners

adopted at a meeting held on April 22nd, 1976

[illegible]
~~Secretary, Local Organization~~
Clerk, Board of Commissioners

Courthouse, 301 Market Street
Steubenville, Ohio 43952
Address Zip Code

Date April 22nd, 1976

Appropriate and careful consideration has been given to the environmental statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service
United States Department of Agriculture

Approved By: Robert E Lundberg
State Conservationist

APR 30 1976
Date

SHORT CREEK WATERSHED

Harrison and Jefferson Counties, Ohio

1975

SUMMARY OF PLAN

This plan is for watershed protection and flood prevention in the Short Creek Watershed. The plan was prepared by the following sponsoring local organizations: Harrison and Jefferson Soil and Water Conservation Districts, The Jefferson County Board of Commissioners, The Village of Councils of Adena and Dillonvale and The Short Creek Conservancy District.

The Short Creek Watershed consisting of 127 square miles (81,280 acres) is located in East Central Ohio. There are 42,526 acres located in Harrison County and 38,754 acres in Jefferson County.

Erosion and the resultant sedimentation are watershed problems. Erosion from active and unreclaimed stripmines in the western portion of the watershed is the greatest single source of sediment. Upland soils on the steeper slopes which are utilized beyond their capability for crop production and for pasture are another significant source of erosion and sedimentation. Isolated acreages of idle land and land in miscellaneous uses without adequate vegetative cover are eroding at excessive rates.

Land treatment practices and measures to be applied will emphasize stripmine reclamation, pasture planting, pasture and hayland management, tree planting, diversions, farm ponds, and grassed waterways.

Conservation land treatment measures are planned for 7,650 acres of cropland, 9,625 acres of pasture and hayland, 560 acres of forest land, and 7,325 acres of miscellaneous (includes strip mines) land. The total estimated cost of land treatment measures is $2,455,400.

Urban damages are the predominant type of flood plain damages in the watershed. Major damages occur at Adena and Dillonvale, with significant damages occurring in Newtown, Olszeski Town, and Pine Valley. Several lives have been lost throughout the history of flooding in the watershed. A total of 531 homes, 86 businesses, and 14 miles of roads are located within the area where flood damage potential exists. Damages to crops and pasture occur frequently on flood plain areas given to agricultural production.

The structural measures selected for this plan include one floodwater retarding structure supplemented with 10.0 miles of channel work mainly through the urban areas to provide 100 year level of protection. The estimated installation cost of structural measures is $4,905,920. The PL-566 share is $4,331,210, leaving a balance of $574,710 to be borne by sources other than PL-566. It is estimated that the planned measures can be installed in about five years.

The total average annual benefits provided by structural measures amount to $433,854 and the estimated annual cost of installing, operating and maintaining the structural measures is $322,920 giving a benefit to cost ratio of 1.3 to 1.0.

The estimated average annual cost of operation and maintenance of the structural measures is $21,650. Their operation and maintenance will be the responsibility of the Conservancy District.

The Short Creek Conservancy District has the authority under Ohio laws to properly and legally execute this plan, including the dominant rights of eminent domain.

INTRODUCTION

This plan has been edited to avoid excessive duplication of information required in the environmental impact statement. Part II should be reviewed for additional information on problems, alternatives, environmental impacts, and use of resources.

PLANNED MEASURES

The Short Creek Watershed Plan consists of acceleration of land treatment measures needed to improve land cover conditions, one floodwater retarding structure, and 10.0 miles of stream channel work.

Conservation land treatment measures are planned for 7,650 acres of cropland, 9,625 acres of pasture and hayland, 560 acres of forest land, and 7,325 acres of miscellaneous land. The Soil Conservation Service will provide technical assistance to landowners and operators in planning and applying needed measures and land use changes. The Ohio Division of Forestry and Reclamation, in cooperation with the U.S. Forest Service, will provide technical assistance for installing the forestry practices.

Measures needed to achieve adequate treatment of cropland include contour stripcropping, crop residue management, minimum tillage farming, and subsurface drainage. Grassland measures include pasture and hayland planting and management, brush management, and spring development. Forest land measures include tree planting, hydrologic cultural operations, and livestock exclusion.

The 7,325 acres of miscellaneous land consist of farmsteads, privately-owned unreclaimed surface-mined land, rural homesteads, and odd areas. Soil conservation practices, planned where needed, for these areas include critical area planting, ponds, wildlife upland habitat management, fish pond management, and recreational area improvement. A vigorous followup program will be provided by the Sponsors in treating the problem areas.

One flood water retarding structure is planned on the Middle Fork of Short Creek, as shown on the project

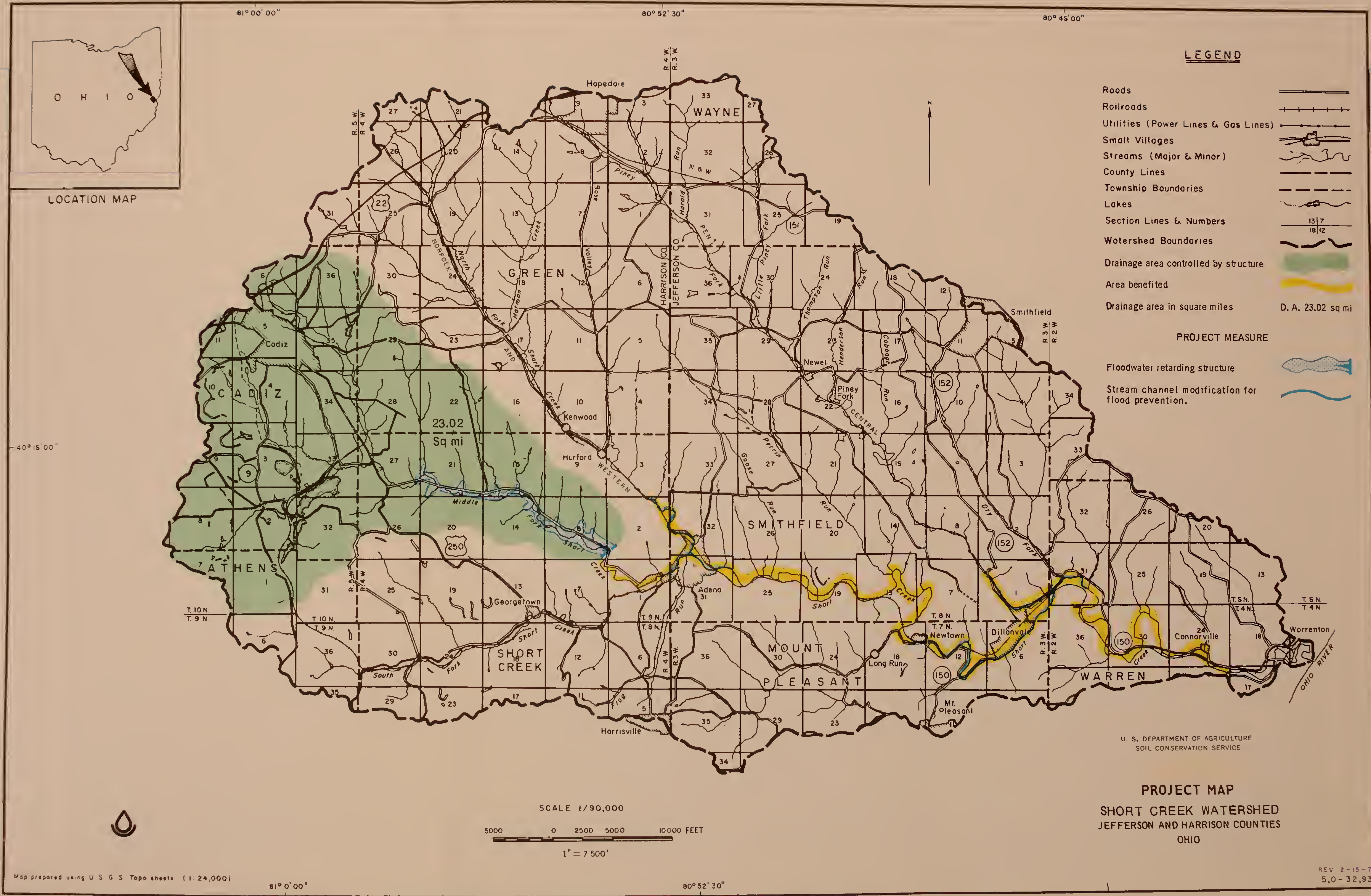
map. The structure will have a reinforced concrete spillway with a vertical drop inlet concrete riser and an energy dissipating outlet. The dam will be designed to impound a 68-acre lake, equivalent in volume to the estimated submerged sediment deposition during the first 50 years of reservoir life. Due to unsatisfactory water quality, the reservoir will remain dry initially. At the end of the 50 year period, the lake level may be raised about nine feet to impound an area equal in volume to the estimated submerged sediment deposition for 100 years.

The reservoir will provide 3,636 acre-feet of flood storage and will control the runoff from 23.02 square miles.

Installation of the dam will require the purchase of, or flowage easements on, about 379 acres of land, 100 acres in the 100-year sediment deposition area, 176 acres periodically inundated, 58 acres in the construction and borrow areas, 38 acres for flowage rights, and 7 acres for dam, spillway, and outflow areas. Mineral rights will be purchased on approximately 26 acres surrounding the dam and spillway area and on approximately 273 acres under the area covered by the retarding pool which is not coincident with the dam and spillway area purchase.

The 10.0 miles of channel segments to be modified by the project flow through rural and urban areas. The modifications are extended downstream from Adena and Dillonvale far enough to minimize the effect of downstream high water on the urban areas. The channel work consists of enlargement and minor realignment of the flow areas. Appurtenant surface water control features are part of the designs, as are spoil placement and management plans and wildlife habitat development.

Channel work will affect an estimated 266 acres including 120 acres of farmsteads and residential areas, 47 acres of forest land, 46 acres of cropland, 24 acres of mine wastes, 19 acres of commercial areas, five acres of urban (vacant) land, and five acres of pastureland.



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During project installation, state and local health, air, and water pollution regulations will be adhered to. Equipment parking areas, haul roads, and other construction areas will be managed to minimize erosion and sedimentation. Where conditions warrant, debris basins will be constructed to minimize sediment reaching the streams.

Seeding of all reshaped banks, spoil areas, permanent easement areas, and all other disturbed areas will be completed as soon as possible. Berm and spoil areas will be seeded with a wildlife habitat meadow mixture or an appropriate lawn mixture. The vegetated areas will be permantly marked with posts or other suitable identification. In pasture areas, fences will be constructed where necessary.

Channel work will be carried out in a manner that will cause minimum damage to surrounding vegetation. Equipment will excavate from one bank only, where possible, to reduce the area that must be cleared for equipment operation.

The 46.8 acres of woods or brush that will be disturbed by channel work will be replaced by about 29.0 acres of trees, 11.2 acres of shrubs, and 6.6 acres of grasses and legumes; all of these plant species will be especially suited to providing wildlife food and shelter.

The Ohio Historical Society has conducted archaeological surveys of the proposed structure sites. Their studies revealed that the project area was inhabited only sporadically by prehistoric Indians, and the Society concluded that the planned reservoir construction and channel work will not adversely affect any archaeological sites. No sites or buildings were discovered which would be eligible for listing in the National Register of Historic Places.

In accordance with Section 3 of PL 93-291 the Secretary of the Department of the Interior will be notified of any archaeological or historical evidence discovered during construction work. Should a discovery reveal significant archaeological or historical

values, further project activity, which could affect the value, will be terminated. Construction will not resume until arrangements satisfactory to the Sponsors, the Service, and the concerned agencies have been made and the agreed to actions implemented. The State Historic Preservation Officer will be consulted in all instances.

INSTALLATION COSTS - MONETARY

Conservation Land Treatment Costs

Detailed installation costs of land treatment measures are shown in Table 1. The total installation cost of the land treatment amounts to $2,455,400 ($2,428,300 for open land and $27,100 for forest land). Of this total, $199,600 represents the cost of technical assistance.

Costs for installing land treatment measures are based on current costs of supervision, labor, equipment and materials needed for each measure. Technical assistance costs are based on projected expenditures and estimated accomplishments.

The costs described above are in addition to $4,328,406 which the landowners have expended to establish land treatment measures prior to the preparation of this plan.

Structural Measures

Construction costs (for labor, equipment and materials) are the engineer's estimated costs which include allowances for contingencies. The engineer's estimates were made by applying appropriate unit costs to detailed quantity estimates. Unit costs, based on the most recent contract bid schedules and actual construction costs of similar projects in Ohio, were adjusted to the 1975 price level. Cost allowances for contingencies, ranging from 12 to 20 percent of the costs, reflect the intensity of site investigations, degree of design detail, and possibility of encountering latent conditions during construction.

Engineering costs are for design surveys, site investigation studies (boring, laboratory tests and reports), designs, preparation and interpretation of drawings and specifications, and similar services.

Project administration costs associated with installation of structural measures are those of contract administration, review of engineering plans, government representation for contracts, administering relocation payments, layout and inspection to assure construction in accordance with drawings and specifications, and overhead. Overhead includes costs of direct and indirect services of the Soil Conservation Service and the Sponsors in installing structural measures under PL-566. The Sponsors and the Service will each bear the costs they incur.

Land rights costs are for acquisition of land and utilities. Acquisition costs include survey, appraisal, legal and other administrative costs of land rights. Land costs include fee simple, easement, and rights-of-way costs of land, mineral rights and improvements. Utility costs include costs of change or removal of existing power, gas and sewer lines, road and other facilities.

Land costs for the Fox Bottom floodwater retarding reservoir are the unit costs (based on fee simple acquisition) determined by the Project Sponsors multiplied by the measured area needed for the dam and spillways, sediment storage, floodwater detention, mineral rights, borrow and construction. Channel work costs are for temporary easements for construction, permanent easements for construction, and operation and maintenance of the improvements. Different unit rates were applied to temporary and permanent easements areas.

The number and type of properties displaced by the Fox Bottom reservoir were determined by field survey. Estimates of relocation payments were made with assistance from people familiar with the area.

The estimated total relocation payments, exclusive of land rights, for the ten properties is $83,510.

Relocation payments are shared by the Service and the sponsors in the ratio that PL-566 funds and other funds are to be used to install the project. The PL-566 share is $50,610 (60.6 percent), and the local share is $32,900 (39.4 percent).

The Sponsoring Local Organizations will provide all relocation assistance advisory services to displaced persons, businesses, or farm operations in order to minimize hardships in adjusting to relocation. These advisory services include: (1) determining needs, (2) obtaining current pertinent information concerning housing programs, costs, etc., (3) developing and handing out brochures, (4) assisting in locating replacement dwellings, and (5) assisting in getting established.

The relocation assistance advisory services will cost an estimated $1,410 which is an administrative cost not subject to PL-566 cost sharing. These services will be provided by the various Sponsors using personnel already employed by them. Coordination of these services will be provided by the Directors of the Short Creek Watershed Conservancy District.

Mitigation Measures

Shrub plantings along the channel border will be repeated in 1,200-foot lengths as needed. The planting of each length is estimated to cost $85. When planting both sides of the modified channel, the cost is estimated at $170 for each 1,200-foot length planted.

Shrubs for replacement habitat will be planted at approximately 1,000 plants per acre at an estimated cost of $460 per acre.

Trees will be planted at about 10-foot intervals, although spaced irregularly. Planting stock will be 440 tree per acre, with an estimated cost of $145 per acre.

Fund Obligations

Fiscal Year	PL-566 Funds Land Treatment	PL-566 Funds Structural Measures	Other Funds Land Treatment	Other Funds Structural Measures	Total Fund Obligations
1	26,660		464,420		491,080
2	26,660	1,078,010	464,420	269,310	1,838,400
3	26,660	915,000	464,420	52,000	1,458,080
4	26,660	2,338,200	464,420	253,400	3,082,680
5	26,660		464,420		491,080
Total	133,300	4,331,210	2,322,100	574,710	7,361,320

BENEFITS - MONETARY

Land treatment measures are basic to the project and essential to achieving maximum benefit from structural measures. Benefits are largely on-site conservation benefits due to improved use and treatment of the soil resources. Benefits to wildlife and recreation will result from many of the planned land treatment measures. Included are ponds, wildlife habitat management, establishment of trails and walkways, and recreation developments. The hydrologic soil condition will be improved by the proposed land treatment measures, thus reducing sediment yield and retarding runoff. Good forest management and continued fire protection will also increase productivity of the forest land.

Off-site project benefits will result from reduced rates of channel sedimentation. Land treatment measures will provide benefits evaluated at $8,798 annually in the watershed, as shown by footnote to Table 6.

Installation of structural works of improvement recommended in this plan will produce average annual benefits of $433,854. Most of these benefits will result from the reduction of flood damage to urban areas. Significant benefits include reduction of future design capacity of some bridges below the structure site, reduced downstream sedimentation, and improved local economic conditions.

Benefits occurring from the reduction of damages to existing urban areas, largely in Adena, Dillonvale, and Newtown, are estimated at $252,525 annually.

Benefits occurring from the reduction of damage to crop and pasture lands are estimated to be $1,046 annually. Other agricultural benefits attributable to reduced damages to farm roads, bridges, culverts, and fences, and reduced debris are estimated to average $158 yearly.

Average annual benefits of $21,747 are anticipated from floodwater damage reduction to public roads and bridges, and $13,163 from railroads. This includes $8,756 in savings for bridge replacement costs.

Indirect benefits amount to $55,856 or 19 percent of the direct benefits. Planned works of improvement will significantly reduce the risk of flooding on nearly 1,000 acres. Reduced risk on this land is expected to bring about more efficient use and result in higher returns.

Redevelopment benefits stemming from project installation as a result of employment of the unemployed or underemployed, are evaluated at $69,293. Included are $5,369 attributable to the cost of operation and maintenance of the works of improvement.

Local secondary benefits stemming from the project were considered to equal 10 percent of the direct primary benefits or $28,864.

The installation of this project would have reduced the $252,000 floodwater damage caused by the major flood of 1963 to about $5,500.

Significant public health benefits will accrue due to the protection from flooding (particularly of urban areas). These benefits include reduced hazards of loss of life and injury, the elimination of health hazards associated with damage to water supply and waste disposal systems, improved vector control, and prevention of other factors accompanying floods which tend to disrupt the maintenance of public health. These

benefits were not evaluated in terms of dollars or claimed in the economic justification of this plan.

COMPARISON OF BENEFITS AND COSTS

The evaluated average annual benefits as provided by structural measures amount to $433,854. This includes local secondary benefits of $28,864. The average annual cost to produce these benefits is $322,920. The ratio of benefits without secondaries to cost is 1.3 to 1.0. The benefit cost ratio, including local secondary benefits, is 1.3 to 1.0.

INSTALLATION AND FINANCING

General

This plan will be carried out as a joint undertaking of private, local, state, and federal agencies. The plan will be installed over a five year period.

Land treatment will proceed concurrently with structural measures. The Fox Bottom Reservoir will be constructed during the second project year. The North Fork and Short Creek channel in the Adena area will be installed in the third year. The Piney Fork and Short Creek channel work in the Dillonvale area will be installed in the fourth year. Adherence to this schedule will contribute to maximum benefits and accomplish construction with the least delay and risk. Mitigation measures will be installed immediately after construction of the corresponding structural measures.

Installation Year	Structural Measures To Be Installed
2	Fox Bottom Reservoir
3	Short Creek and North Fork Channel Work in the Adena Area.
4	Short Creek and Piney Fork Channel Work in the Dillonvale Area.

Land Treatment

Owners and operators of watershed lands will install land treatment measures in cooperation with their Soil

and Water Conservation Districts. The Soil Conservation Service will provide technical assistance through the Harrison and Jefferson Soil and Water Conservation Districts. The Ohio Division of Forestry and Reclamation, in cooperation with the U.S. Forest Service, will provide technical assistance to landowners for installation of planned forestry measures.

The Ohio Division of Forestry and Reclamation, in cooperation with the U.S. Forest Service and other agencies, will provide technical assistance to private and public owners in planning, developing and managing trees and related plant communities. The amount of assistance furnished will be determined and influenced by the needs and desires of the Sponsors, the community leaders and the landowners.

Structural Measures

The Short Creek Conservancy District will administer contracts for installation of structural measures and provide such inspection and similar services as they deem necessary to protect their interest. The Soil Conservation Service will administer contracts only at the request of the Conservancy District.

The Soil Conservation Service will provide engineering and administrative services for structural and mitigation measure construction and installation. Engineering services include design surveys, geologic investigations and tests, designs, preparation of construction drawings and specifications, and similar services. Project administration services include preparation of construction contracts, government representation for contracts, construction surveys and inspection, and similar services for installation of structural measures.

The Short Creek Conservancy District will acquire all land rights for installation, operation, and maintenance of structural measures. Land rights include use of lands and improvements, mineral rights and utility alterations. The Conservancy District will, where necessary, execute agreements with utility owners and local government authorities for constructing

utility alterations. All property affected by the structure site will be purchased. Where only access routes are temporarily flooded, all-weather alternate routes will be provided.

Relocation

Appraisals will be obtained as a prerequisite to securing land rights in accordance with provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat., 1894).

The Conservancy District has dominant rights of eminent domain and authority to raise funds by benefit assessments or other means. In securing land rights for construction, operation and maintenance of the structural works of improvement, all authority vested in the Conservancy District will be used as needed to complete the project.

It is the responsibility of the Short Creek Watershed Conservancy District to provide relocation assistance advisory services. These services are:

1. Determine the need, if any, of displaced persons for relocation assistance;

2. Provide current and continuing information on the availability, prices, and rentals of comparable decent, safe, and sanitary sale and rental housing, and of comparable commercial properties and locations for displaced businesses and farm operations;

3. Assure that, within a reasonable period of time prior to displacement, replacement dwellings will be available;

4. Assist a displaced person, displaced from his business or farm operation, in obtaining and becoming established in a suitable replacement location;

5. Supply information concerning housing programs, disaster loan programs, and other federal or state programs offering assistance to displaced persons;

6. Provide other advisory services to displaced persons in order to minimize hardships to such persons in adjusting to relocation;

7. Advise displaced persons that they should notify the displacing agency before they move; and

8. Prior to initiation of acquisition, provide persons from whom it is planned to acquire land a brochure or pamphlet outlining the benefits to which they may be entitled.

The Sponsors will provide each displaced person, business, or farming operation with written notice at least 90 days before they are to vacate.

The sponsors have conducted a survey in the vicinity of Cadiz and Adena and have determined that decent, safe, and sanitary replacement dwellings are available for those displaced by the reservoir. At least once each year the Sponsoring Local Organizations will publish information about the areas flooded by the 100-year storm. This will create a greater flood hazard awareness. The Sponsors will prevent (to the extent possible) reconstruction and new developments in the areas which are subject to flooding by the 100-year event. The Ohio Department of Natural Resources will assist the Sponsors in developing flood plain land use controls.

The Short Creek Conservancy District will carry the financial responsibility for the local share of the costs of installing and maintaining all structural measures. Conservancy District funds may be raised by assessments to benefited properties under authority of the Ohio Revised Code covering Conservancy Districts, or by other means. Local share of costs are shown throughout the plan as "other" costs. The Conservancy District has analyzed its financial needs in consideration of the installation schedule of structural measures and assured that funds will be available when needed.

The total "other" cost of all structure measures in the project is estimated to be $574,710 as shown in

Tables 1 and 2. This includes the costs for Relocation Assistance Advisory Services that must be provided by the District without PL-566 cost sharing assistance.

The Sponsoring Local Organizations will administer contracts unless the Sponsors, at a later date, request the Soil Conservation Service to administer contracts. When legal requirements have been met, the Soil Conservation Service will make available an estimated $4,331,210 of PL-566 funds. These funds will be furnished as they are needed and as they become available. An estimated $861,410 of PL-566 funds for engineering, relocation payments, and project administration will be utilized by the Soil Conservation Service as shown on Table 2.

Federal financial and other assistance to be furnished in carrying out this plan is contingent on the appropriation of funds for that purpose.

The installation costs for conservation land treatment measures are the responsibilities of the landowners. Agricultural Conservation Program (ACP) cost-sharing and other programs will be used insofar as possible. Technical assistance for installation of conservation land treatment measures for which the Soil Conservation Service is responsible will be made available through PL-566 funds and from the going program of Soil Conservation Service assistance to Soil and Water Conservation Districts. Technical assistance for installation of forestry measures will be shared by the State and Federal Governments through the Cooperative Forest Management Program.

OPERATION AND MAINTENANCE PROVISIONS

Landowners and operators will operate and maintain conservation land treatment measures on their lands. Technical assistance will be available for operation and maintenance from the Harrison and Jefferson Soil and Water Conservation Districts, the U.S. Forest Service, and the Ohio Department of Natural Resources, Division of Forestry and Reclamation in cooperation with the U.S. Forest Service.

The Short Creek Watershed Conservancy District will operate and maintain structural project measures upon acceptance of construction work from the contractor. Funds for the work will be obtained by the Conservancy District through the procedures of the Conservancy District Law of Ohio. The district will use its staff, equipment, and materials, or other means satisfactory to the Soil Conservation Service, to do the work.

The Soil Conservation Service and the Short Creek Watershed Conservancy District will complete an operation and maintenance agreement for each structural measure before signing a land rights, relocation, or project construction agreement. The agreements will provide for establishment periods, inspections, and reports. They will include specific provisions for retention and disposal of real and personal property acquired or improved with PL-566 funds. The agreements will be in accordance with the State of Ohio Operations and Maintenance Handbook published by the Soil Conservation Service and will document the responsibilities of the Conservancy District and the Soil Conservation Service. An operation and maintenance plan will be prepared for each structural measure.

A period of three years or less after contruction will be allowed to establish the vegetative cover associated with each structural measure. During this time, cost sharing for any work needed to obtain satisfactory vegetative cover will be allowed at the same rate as that for installing the original works. After the establishment period, reestablishing vegetative cover will be a maintenance responsibility of the Conservancy District.

The planned structural measures are designed to function without routine operational activities. The Fox Bottom reservoir will have a means of draining water from the sediment pool, which will remain dry until the Conservancy District and the Ohio Environmental Protection Agency determine that the water quality is suitable for impoundment. Any incidental public recreation use that may be allowed in the reservoir area is contingent upon improvement of water quality and the Conservancy District's providing adquate sanitary facilities in accordance with state law and upon its

developing, promulgating, and enforcing use regulations. The District will take actions necessary to prevent public access and use of the reservoir if water quality does not improve and sanitary facilities are not provided.

Maintenance work will be done to keep the structural measures in good condition for proper functioning during the project life. The Fox Bottom reservoir and channel work have design lives equal to that used in economic evaluation of the project (100 years). The Conservancy District will protect the permanent vegetation from farming activities or urban encroachment by prompt, timely enforcement of land rights instruments.

Where vegetation is damaged by maintenance work or natural forces, it will be restored to comparable quality and quantity by the project Sponsors. Wildlife habitat quality will be maintained on areas planted as part of the project measures by replanting or by management of natural plant successions.

Vegetative growth established for erosion control in the reservoir and stream construction areas will be maintained in a vigorous condition by fertilizing, reseeding, and other means as necessary. Unwanted vegetation will be controlled by mowing or other means. Mowing will be delayed until after July 1 to minimize disturbances to nesting and young wildlife. During the establishment period, earlier mowing will be used, if needed, to control competition from annual plants.

Erosion damage will be repaired promptly and rodents controlled where necessary. Debris and sediment accumulations will be removed, where they are creating flow restrictions in channel work reaches. Concrete and metal work will be maintained in good functional order by painting, repairing, or replacing as necessary.

Public and private bridges, other road facilities, and public utilities which have been modified to accommodate the project will be maintained by their respective owners with expenditures from their normal maintenance funds.

To assure an effective maintenance program at minimum cost, inspections of the Fox Bottom reservoir and channel work areas will be made annually, after unusually severe storms, and whenever other unusual conditions may adversely affect the structural measures. During the first three years for each structural measure, the Soil Conservation Service and the Conservancy District will jointly conduct the inspections; thereafter, the Soil Conservation Service will determine if its participation is necessary. Authorized persons will have free access for inspections at any reasonable time. The Sponsoring Local Organization will continue the inspections of each structural measure after the third year of its completion.

The inspections will determine if conditions of the structural measures are favorable for their proper functioning. Written inspection reports will describe needed maintenance work and will include cost estimates for the work.

Typical inspection items for a reservoir include the following: drainage systems, relief wells and outlets; evidence of slope instability such as slides, slumps or cracking; condition of vegetation; evidence of rodent or erosion damage; and the condition of riprap, concrete and metal work.

Typical inspection items for channel areas include the following: the condition of and around drain pipe outlets, concrete water inlets and retaining walls, and channel lining materials; evidence of excessive erosion, deposition, or rodent damage; condition of vegetation and maintenance travelways; and the quality of wildlife habitat areas that were established to mitigate habitat losses from the project's construction.

The Conservancy District will maintain records of inspections on continuing and completed maintenance work; it will furnish reports of these activities to the Soil Conservation Service and the Division of Water of the Ohio Department of Natural Resources. Periodic reports will continue until all deficiencies described in inspection reports are satisfactorily corrected.

For complex or unusually difficult or extensive maintenance work, the Soil Conservation Service may provide technical assistance such as drawings, specifications and layout if the Conservancy District requests the assistance.

The Conservancy District will prohibit installation of facilities or appurtenances that would interfere with the operation and maintenance of the structural measures. The District will obtain Soil Conservation Service approval of any drawings and specifications for altering or repairing a structural measure.

The estimated total average annual operation and maintenance costs shown in Table 4 are $21,650. This includes $16,520 for channel work, $800 for the Fox Bottom Reservoir, and $4,330 for Conservancy District office and other operating expenses. Funds needed will be raised by the District through normal legal procedures.

Table 1
ESTIMATED PROJECT INSTALLATION COST

Short Creek Watershed, Ohio

Sheet 1 of 2

Installation Cost Item	Acres To Be Treated 2/	Estimated Cost (Dollars) 1/ PL-566	Other	Total
CONSERVATION LAND TREATMENT				
Soil Conservation Service				
Cropland	7,650	-	21,400	21,400
Grassland	9,625	-	546,300	546,300
Miscellaneous Land	7,325	-	1,666,200	1,666,200
Technical Assistance	-	133,300	61,100	194,400
SCS Subtotal	24,600	133,300	2,295,000	2,428,300
Forest Service				
Forest Land	560	-	21,900	21,900
Technical Assistance	-	-	5,200	5,200
FS Subtotal	560	-	27,100	27,100
TOTAL CONSERVATION LAND TREATMENT	25,160	133,300	2,322,100	2,455,400

1/ Price Base 1975

2/ Non-Federal Land

Table 1
ESTIMATED PROJECT INSTALLATION COST
Short Creek Watershed, Ohio

Sheet 2 of 2

Installation Cost Item	Number and Unit	Estimated cost (Dollars) 1/ PL-566	Other	Total
STRUCTURAL MEASURES				
Construction				
Soil Conservation Service				
Floodwater Retarding Structures	1	794,400	-	794,400
Stream Channel Work	10.0 mi.	2,675,400	-	2,675,400
SUBTOTAL-Construction		3,469,800	-	3,469,800
Engineering Services				
Soil Conservation Service		211,800	-	211,800
SUBTOTAL-Engineering		211,800		211,800
Relocation Payments				
Above Floodwater Retarding Structure		50,610	32,900	83,510
SUBTOTAL-Relocation Payments		50,610	32,900	83,510
Project Administration				
Soil Conservation Service				
Construction Inspection		450,000	-	450,000
Other		149,000	86,100	235,100
Relocation Assistance Advisory Services		-	1,410	1,410
SUBTOTAL-Project Administration		599,000	87,510	686,510
Other Costs				
Land Rights		-	454,300	454,300
SUBTOTAL-Other		-	454,300	454,300
TOTAL STRUCTURAL MEASURES		4,331,210	574,710	4,905,920
TOTAL PROJECT		4,464,510	2,896,810	7,361,320
Summary				
Subtotal SCS		4,464,510	2,869,710	7,334,220
Subtotal FS		-	27,100	27,100
TOTAL PROJECT		4,464,510	2,896,810	7,361,320

1/ Price Base 1975

March 1976

[illegible]

Table 1A - Status of Watershed Works of Improvement

Short Creek Watershed, Ohio

Measure	Unit	Applied To Date	Total Cost (Dollars)1/
CONSERVATION LAND TREATMENT			
Establishing, Expanding, or adding to Recreation Developments for primarily Noncommercial use	No.	14	2,800
Establishing, Expanding, or adding to public Recreation Development	No.	2	1,000
Brush Management	Ac.	1,086	43,444
Conservation Cropping System	Ac.	9,701	9,701
Contour Farming	Ac.	6,255	1,251
Critical Area Planting	Ac.	8,878	3,107,300
Crop Residue Management	Ac.	1,848	2,957
Diversions	Ft.	6,500	1,300
Pond	No.	90	108,000
Fishpond Management	No.	90	1,350
Grassed Waterway or outlet	Ac.	4	1,000
Hedgerow Planting	Ft.	60,000	3,000
Livestock Exclusion	Ac.	1,143	4,572
Drainage Main or Lateral	Ft.	1,000	500
Pasture & Hayland Management	Ac.	7,922	237,660
Pasture & Hayland Planting	Ac.	5,724	343,440
Pipeline	Ft.	11,978	5,989
Access Road	Ft.	16,560	33,120
Recreation Area Stabilization	Ac.	6	2,100
Recreation Area Improvement	Ac.	80	6,000
Recreation Land Grading and Shaping	Ac.	25	5,000
Recreation Trail & Walkway	Ft.	15,180	1,518
Spring Development	No.	180	58,500
Contour Stripcropping	Ac.	8,832	70,656
Subsurface Drain	Ft.	36,058	14,423
Trough or Tank	No.	211	15,825
Wildlife Upland Habitat Management	Ac.	4,670	93,400
Land Adequately Treated	Ac.	51,988	-
Tree Planting	Ac.	73	3,100
Tree Planting (strip mine)	Ac.	6,900	138,000
Hydrological Cultural Operation	Ac.	52	1,400
Proper Grazing Use	Ac.	170	2,000
Prescribed Burning	Ac.	8,130	8,100
TOTAL CONSERVATION LAND TREATMENT			4,328,406

1/ Price Base 1975

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Table 2

ESTIMATED STRUCTURAL COST DISTRIBUTION

Short Creek Watershed, Ohio
(Dollars) 1/

Item	Installation Cost							
	PL 566 Funds				Other Funds			
	Construction	Engineering	Relocation Payments	Total PL 566	Land Rights	Relocation Payments	Total Other	Total
Floodwater Retarding Structures:								
Fox Bottom	794,400	62,000	50,610	907,010	211,200	32,900	244,100	1,151,110
Channel Work								
Dillonvale and Piney Fork	1,963,300	109,900	-	2,073,200	207,700	-	207,700	2,280,900
Adena and North Fork	712,100	39,900	-	752,000	35,400	-	35,400	787,400
SUBTOTAL	3,469,800	211,800	50,610	3,732,210	454,300	32,900	487,200	4,219,410
Project Administration				599,000			87,510	686,510
GRAND TOTAL	3,469,800	211,800	50,610	4,331,210	454,300	32,900	574,710	4,905,920

1/ Price Base 1975

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Table 3 - Structural Data

Fox Bottom Reservoir
Short Creek Watershed, Ohio

Item	Unit	Quantity
Class of Structure		c
Drainage Area - Total	Sq.Mi.	23.02
Runoff Curve No. (1-Day, AMC II)		81
Time of Concentration	Hr.	2.4
Elevation Top of Dam	Ft.	989.6
Crest of Emergency Spillway	Ft.	967.3 1/
Crest of Principal Spillway Inlet	Ft.	931.5
Maximum Height of Dam	Ft.	88
Volume of Fill	Cu. Yds.	306,700
Total Capacity	Ac. Ft.	6,274
Sediment, Submerged, 1st 50 yrs.	Ac. Ft.	718
Sediment, Submerged, 2nd 50 yrs.	Ac. Ft.	704
Sediment, Aerated, 100 year total	Ac. Ft.	267
Retarding	Ac. Ft.	3,636
Design	Ac. Ft.	949 1/
Surface Area		
Sediment Pool (1st 50 yrs.)	Acres	68
Retarding Pool	Acres	280
Principal Spillway Design		
Rainfall Volume (Areal, 1 day)	In.	5.1
Rainfall Volume (Areal, 10 days)	In.	8.6
Rainfall Volume (10 days)	In.	4.5
Capacity of Principal Spillway (Max.)	C.F.S.	30
Diameter of Conduit	In.	48
Emergency Spillway Design		
Frequency of Operation	% Chance	Less than 1 1/
Type		Rock
Bottom Width	Ft.	150
Rainfall Volume (ESH)(Areal)	In.	8.8
Runoff Volume (ESH)	In.	6.5
Maximum Flow Velocity (Ve)	Ft./Sec.	12.0
Exit Channel Grade	Percent	2.1
Maximum Water Surface Elevation	Ft.	973.4
Freeboard Design		
Rainfall Volume, (FH)(Areal)	In.	23.7
Runoff Volume, (FH)	In.	21.1
Maximum Water Surface Elevation	Ft.	989.6

Table 3 - Structural Data cont'd

Item	Unit	Quantity
Capacity Equivalents		
Sediment Volume, 100-year Total	In.	1.38
Retarding Volume	In.	2.96
Design Volume	In.	0.77 1/

1/ Emergency spillway crest elevation has been raised four feet above the routed minimum for economy in design.

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Table 3A - Structural Data

Channels

Short Creek Watershed, Ohio

Downstr. Sta. of Reach	Design Drainage Area Sq. Mi.	Capacity cfs Req'd	Capacity cfs Design	Water Surface Elev. (ft.)	Hydraulic Gradient (ft/ft)1/	Channel Dimensions Bottom Width (ft.)	Channel Dimensions Depth (ft.) 1/	"n" Value Aged	"n" Value As Built	Ten-Year Velocities Aged (fps)	Ten-Year Velocities As Built (FPS)	Excavation Volume (C.Y.)	Riprap Volume (C.Y.)	Type of Work9/	Before Project Channel Type 10/	Before Project Flow Condition11/
SHORT CREEK IN DILLONVALE																
1073+43	84.8			769.6	(Upstream end of Reach)		8.0	Side Slopes 2:1 except as noted								
1188+95	86.1	7450	7450	740.8	.0025	90	8.0	.030	.030	7.3	7.3	423,170	16,673	II	N	Pr
1212+82	87.8	7500	7500	736.6	.00203/	102	8.6	.030	.030	6.65/	6.65/	293,82312/	37,01912/	II12/	N12/	Pr12/
1215+42	87.8	7500	7500	735.3	.00203/	Transition7/	8.4	.030	.030	8.25/	8.25/					
1224+00	87.8	7500	7500	733.0	.00603/	50	11.5	.030	.030	11.25/	11.25/					
1227+00	87.8	7500	7500	732.4	.00203/	50	11.5	.030	.030	7.55/	7.55/					
1228+35	87.8	7500	7500	732.0	.00203/	404/	11.2	.030	.030	9.15/	9.15/					
1229+35	87.8	7500	7500	731.5	.00203/	406/	10.8	.0272	.0272	10.45/	10.45/					
1229+45	87.8	7500	7500	731.4	.00203/	404/	10.8	.030	.030	9.75/	9.75/					
1231+45	87.8	7500	7500	730.8	.00203/	50	10.6	.030	.030	8.05/	8.05/					
1251+45	87.8	7500	7500	728.4	.000053/	102	8.0	.030	.030	6.15/	6.15/					
1284+45	87.8	7500	7500	721.8	.0020	102	8.0	.030	.030	6.6	6.6	254,723	13,719	II	N	Pr
1303+75	119.6	9685	9685	718.7	.0020	128	8.2	.030	.030	7.0	7.0	57,610	3,096	II	N	Pr
2/1327+75	124.0	9686	9686	713.7	.0020	94	8.7	.025	.025	8.4	8.4	41,215		II	N	Pr
PINEY FORK IN DILLONVALE																
750+00	21.1			753.1	(Upstream end of Reach)		6.0	All side slopes 2:1								
834+20	22.8	2500	2500	719.7	.0040	36	6.0	.035	.023	6.4	8.6	78,489		II	N	Pr
SHORT CREEK IN ADENA																
650+00	40.9			877.4	(Upstream end of Reach)		8.9	All side slopes 2:1								
664+00	41.2	2450	2451	867.9	.0066	--	--	.030	.030	9.5	9.5		1,880	IV	N	Pr
703+00	65.9	2450	2450	854.5	.0032	22	7.8	.035	.023	6.2	8.4	9,246		II	N	Pr
722+00	66.4	6300	6300	850.7	.0020	88	7.7	.030	.030	6.4	6.4	26,600	14,077	II	N	Pr
761+25	66.9	6500	6300	842.5	.0020	66	7.8	.030	.030	6.9	6.9	39,600	6,446	II	N	Pr

Footnotes are at end of table.

Table 3A - Structural Data cont'd

Channels
Short Creek Watershed, Ohio

Downstr. Sta. of Reach	Design Drainage Area Sq. Mi.	Capacity cfs Req'd	Capacity cfs Design	Water Surface Elev. (ft.)	Hydraulic Gradient (ft/ft)1/	Channel Dimensions Bottom Width (ft.)	Channel Dimensions Depth (ft.) 1/	"n" Value Aged	"n" Value As Built	Ten-Year Velocities Aged (fps)	Ten-Year Velocities As Built (FPS)	Excavation Volume (C.Y.)	Riprap Volume (C.Y.)	Type of Work9/	Before Project Channel Type 10/	Before Project Flow Condition11/
NORTH FORK IN ADENA																
546+63	20.5			889.2	(Upstream end of Reach)		7.0	All side slopes 2:1								
565+15	21.3	3500	3500	877.4	.0064	30	7.0	.030	.030	9.1	9.1	15,690	2,347	II	N	Pr
624+50	22.5	3500	3500	854.7	.0040	30	8.0	.030	.030	8.3	8.3	25,400	8,566	II	N	Pr

1/ Hydraulic gradients and depths shown are for uniform flow conditions. Retarding effects of downstream reaches alter values. See Appendix E.
2/ Reach under influence of downstream water surface elevation.
3/ Channel bottom gradient. Flow is nonuniform.
4/ Side slopes 1 3/4:1.
5/ Maximum in reach with nonuniform flow.
6/ Side slopes 1 3/4:1 on right side and ½:1 on left side.
7/ 102 ft. to 50 ft.
8/ Station 1188+95 to Station 1284+00.
9/ II - Enlargement and/or realignment of existing stream channel; IV - clearing and loose debris removal within channel.
10/ N - An unmodified, well-defined natural stream channel.
11/ Pr - Perennial; flows at all times except during extreme drought.
12/ Pertains to Stations 1212+82 to 1251+45.

Table 4

ANNUAL COST

Short Creek Watershed, Ohio
(Dollars)1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost	Total
All Structural Measures	259,110	21,650	280,760
Project Administration	42,160	-	42,160
TOTAL	301,270	21,650	322,920

1/ Price Base 1975

2/ One hundred years at 6 1/8 percent interest.

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Table 5
ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE
REDUCTION BENEFITS

Short Creek Watershed, Ohio
(Dollars) 1/

Item	Estimated Average Annual Damage Without Project	With Project	Damage Reduction Benefit
Floodwater			
Crop and Pasture	3,297	2,251	1,046
Other Agricultural	495	337	158
Nonagricultural			
Public Roads and Bridges	28,225	6,478	21,747 2/
Railroads	13,163	- 3/	13,163
Urban			
Residential	135,335	6,062	129,273
Commercial	129,205	5,953	123,252
Subtotal	309,720	21,081	288,639
Indirect	59,813	3,957	55,856
Total	369,533	25,038	344,495

1/ Price Base 1975 for Nonagricultural and Urban prices and adjusted normalized for Crop and Pasture and Other Agricultural prices.
2/ Includes $8,756 savings in bridge replacement costs.

3/ Maximum event evaluated was the 100 year flood.

March 1976

[illegible]

Table 6

Comparison of Benefits and Costs for Structural Measures
Short Creek Watershed, Ohio
(Dollars)

Evaluation Unit	Average Annual Benefits 1/ Damage Reduction	Redevelopment	Secondary	Total	Average 2/ Annual Cost	Benefit Cost Ratio
Short Creek Watershed	335,697	69,293	28,864	433,854	280,760	1.5
Project Administration					42,160	
Grand Total	335,697 3/	69,293	28,864	433,854	322,920	1.3

1/ Price Base 1975 for all benefits except crop and pasture and other agricultural benefits which are adjusted normalized.

2/ From Table 4.

3/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $8,798 annually.

March 1976

PRINCIPLES AND STANDARDS PHASE-IN ADDENDUM

SHORT CREEK WATERSHED PLAN

Harrison and Jefferson Counties, Ohio
June 1975

INTRODUCTION

The addendum was developed in accordance with phase-in procedures adopted by the Water Resources Council for implementation of the Principles and Standards for Level C plans on which field studies, analyses, and evaluations were completed as of October 25, 1973, and which have been formulated in accordance with Senate Document 97 as supplemented and amended, and which are to be transmitted to the OMB before June 30, 1976.

Part I

BENEFIT-COST RELATIONSHIP

The Plan is based upon 6 1/8 percent interest and 1975 prices. The average annual costs are $322,920 and average annual benefits are $433,854. The B:C ratio is 1.3:1.0.

Part II

ABBREVIATED ENVIRONMENTAL QUALITY PLAN

Environmental Concerns

The area of concern is basically the Short Creek Watershed located in the east central portion of Ohio. The stream flows from west to east and is a direct tributary to the Ohio River. The planning area extends from the headwaters downstream to the confluence of Short Creek and Little Short Creek, but the area affected extends to the confluence with the Ohio River. The planning area consists of 81,280 acres, of which 42,526 acres are in Harrison County and 38,754 acres are in Jefferson County.

Short Creek lies within the Allegheny Plateau which is characterized by hilly terrain with entrenched streams and narrow valleys. The stream and its tributaries follow winding devious courses with many short meanders and steep banks. It is thought that the twisted nature of the streams resulted from flow reversal of the preglacial Ohio River.

The watershed was not covered by the Wisconsin glacier since the ice that overran northeastern Ohio did not extend this far south. However, the ice affected the environment of the area, creating tundra conditions. This may well have been followed by spruce parkland and finally a boreal forest of spruce, fir and pine. The remains of various Pleistocene mammals discovered in surrounding counties indicate that these creatures may have inhabited this area, but there are no recorded findings in the watershed.

As the glacier receded, the coniferous forests were replaced by deciduous trees. The bottom lands were dominated by white oaks, red oaks, sugar maples, walnuts, ash, elms, basswood and hickories. The higher elevations were mixed oak forests mingled with several types of hickories. These forests supported a wide variety of fauna, including such modern species as deer, beaver, wild turkey, elk, and bear.

Official records indicate no evidence of Pleistocene man in the area; however, local amateur archaeologists have collected a number of Indian artifacts in the Short Creek Valley. The deciduous woods that replaced the boreal forests provided a much more favorable habitat for the prehistoric Indians. The rough topography of the area is not well suited to a farming culture, but two sites have been identified beyond the watershed boundary where prehistoric Indians established permanent communities. Other communities may have existed but they would likely have been destroyed by the extensive surface mining in the area.

The major industry in the planning area is bituminous coal mining. A fairly flat coal seam averaging four feet in thickness lies generally under the area. Nearly 80 percent of the coal output is from stripping

or surface mining operations. By law, stripping operations must follow certain minimum reclamation practices. Before the first reclamation law in 1949, some voluntary attempts were made to reforest spoil banks with hardwood mixtures.

Coal mines and mining communities in most of the area are not aesthetically impressive. Coal as a source of power, has attracted little industry to the watershed. Steam-electric plants are found in some locations, but manufacturing has notably lagged throughout most of the area, including the Short Creek Watershed.

Agriculture is the only other major economic enterprise in the watershed. A number of the watershed inhabitants are employed in large urban centers outside the watershed. Economic conditions in these urban centers have a greater effect on employment levels in the Short Creek Basin than do local economic conditions.

Population of the watershed is roughly 10,000; over half live in the communities of Cadiz, Adena, and Dillonvale. All land is in private ownership with the exception of schools, streets, highways, and other such public holdings. Coal companies own about one-third of the land, and 46 percent of the area is classified as farm land.

Environmental concerns center around the area's economic development. The development history has been one of utilizing forests, fields, and mines. Although all three types of uses have declined, none has ceased altogether. Their persistence in the economy is due primarily to the terrain and economic opportunities. Pioneers judged the desirability of land mainly by the tree cover it supported. In general, the soils of Harrison and Jefferson counties have been fairly productive, expecially those derived from abundant and easily soluble limestones. Most of the thin soils were especially adapted to forest growth, but when brought under exhaustive use, did not hold up well unless crops were rotated and fertilized. As a result, many farms became marginal or submarginal. In recent years large acreages have reverted to low grade pastures and forest. Sizable acreages have been surface-mined and must be reclaimed to become useful.

Poor farming practices and surface mining have caused erosion and sedimentation throughout the watershed, resulting in top soil loss, reduced soil fertility, road drainage system damage, channel degradation, and reduced water quality. Vegetative cover loss is increasing runoff, increasing flood hazards, and reducing stream flows during dry periods. The streams carrying mine effluent have higher than normal mineral content.

Pollution abatement is a problem. The effluent from the Cadiz sewage treatment plant causes some problems, particularly during periods of low flow. There is also an abatement problem downstream from the Hanna Coal Company preparation plant near Georgetown.

The Ohio stripmine law which became effective April 10, 1972, requires the abatement of pollution and adverse effects of substantial deposition of sediment, landslides, accumulation or discharge of acid water, and flooding from those areas being mined for coal. The law requires the operator to reshape the land, replace the top soil, and establish vegetative cover on the area stripped.

The National Pollution Discharge Elimination System (NPDES) permit program required that all operations that produce a point discharge into state waters must meet the state water quality requirements.

These laws if adequately enforced should reduce pollution from point sources and coal mining operations.

Many acres of forest have been high-graded to such an extent that they are now relatively unproductuve. Landowners are making few efforts to establish sustained timber yields. If properly managed, most woodlands in the study area can produce excellent hardwood timber.

Specific Objectives

Three elements of the plan for improving the environmental quality in the watershed are as follows:

A. Actions for biological preservation or enhancement.

1. Revegetate 3,000 acres of "abandoned" surface mine lands which contribute excessive sediment to the streams and support only sparce wildlife populations.

2. Plant trees and shrubs in strips up to 100 feet wide on approximately 500 acres of land adjacent to channels. The strips will filter sediment and serve as travel lanes for wildlife.

3. Improve terrestrial habitat by establishing 270 miles of permanent woody and herbaceous cover on farms and field boundaries.

B. Actions for human health and water quality improvement. Apply the effluent from the Cadiz sewage treatment plant to the revegetated surface mined areas. This will remove the effluent from the stream, improve water quality and speed-up the recovery of the sediment producing surface mine areas. Project installation will enhance the aesthetic value of the area.

Formulation and Coordination

The plan was formulated by the Soil Conservation Service, the United States Forest Service and the Ohio Department of Natural Resources. Comments on the draft environmental impact statement for the Short Creek Plan were used to assess the concerns and desires of others. Those whose comments were used included: United State Environmental Protection Agency; United States Army Corps of Engineers; United States Department of the Interior; United States Department of Health Education and Welfare; United States Department of Transportation; United States Department of Commerce; Ohio Environmental Protection Agency; The Brook-Hancock-Jefferson Metropolitan Planning Commission; the Appalachian Regional Commission; and the Central Midwest Representative of the National Audubon Society. The information supplied in an archaeological

survey conducted by the Ohio Historical Society under contract to the Soil Conservation Service was also used in plan formulation.

Conservation Land Treatment

The land treatment phase of the abbreviated environmental quality plan would comprise three parts: (1) continuation of the ongoing land treatment carried out by the land owners in cooperation with the Soil and Water Conservation Districts under existing cooperative agreements, (2) acceleration of the ongoing land treatment, and (3) special treatment measures designed primarily to deal with problems related to mining operations in the watershed.

One of the special treatment measures would be revegetation of 3,000 acres of abandoned surface-mined lands. These acres were mined prior to the reclamation laws and have only naturally occurring revegetation. These areas contribute excessive sediments to the streams and contribute to the water quality problems in the watershed. The revegetation of these acres would also provide improved wildlife upland habitat.

Another special measure would be the planting of trees and shrubs on 500 acres adjacent to the streams. These strips would be up to 100 feet wide and would act as filter strips to trap sediment moving toward the stream. Trees and shrubs utilized for these plantings would be especially suited to providing good wildlife food and shelter.

The total land treatment phase would include the treatment of 28,660 acres in addition to those acres being treated under the ongoing programs of the Soil Conservation Service. Over 3,000 acres of the treated area would be planted to trees with other acres to be planted to other woody and herbaceous cover improving the terrestrial habitat. It is estimated that the installation of these measures would cost approximately $2,677,500 and would be installed over a 5-year period. Funding for the measures would be comprised of a combination of federal, state, local and private monies.

Nonstructural Measures

The nonstructural phase of the plan would consist of flood plain management to include flood proofing, flood insurance and flood plain zoning.

Because of the extensive development in the vicinity of Adena and Dillonvale, a selective flood proofing program would be undertaken, involving all public buildings and commercial and industrial establishments as well. The flood proofing of residential properties would be restricted to those having first floor elevations below the 10-year flood event. The flood proofing could be accomplished by sealing basement windows, doors, drains, and other points of entry or constructing dikes or levees to prohibit flood water entry. In some cases it could be possible to raise the building to have the first floor above flood level. This phase would involve 160 structures and would cost an estimated $461,800.

Both Adena and Dillonvale are eligible for the emergency flood insurance program and can become eligible for the regular program. The estimated annual cost for flood insurance premiums would be about $203,200. The program would be federally subsidized, with the costs shared at about $152,400 of federal expense and $50,800 from property owners. Coverage alternatives could cause premium variations under the regular program.

The insurance payments for flood damages incurred by participants in the program would provide reimbursement for the value of damaged property and household items according to insurance program guidelines. However, payments would not be adequate either to totally replace items destroyed or damaged, or to provide for related items such as cleanup, inconvenience and other indirect damages.

It would be necessary for the communities involved to adopt land use zoning ordinances to satisfy flood insurance requirements within the presently urbanized flood plain. However, the communities could use a zoning program which would restrict development of

undeveloped areas of the flood plain below the 100-year flood elevation. This zoning would restrict improvements to existing developments and prohibit reconstruction below the 100-year flood line.

Structural Measures

A single purpose sediment control reservoir would be constructed in the Fox Bottom area of Middle Fork. When the water quality reached suitable levels the dam would impound a 110-acre lake which would gradually fill with sediment during the reservoir's 100-year useful life.

The reservoir would provide a small amount of flood flow reduction, since it is more economical to install a spillway system smaller than that required to discharge the peak flows expected from the design storm. A portion of the design storm inflow would be temporarily stored in the reservoir; therefore, the maximum outflow from the reservoir would be less than the maximum inflow.

The lake and reservoir area would provide a nucleus for hunting, fishing, and picnicking activities after planned land treatment measures are installed and point source water pollution abated assuring water quality suitable for the intended recreational uses.

The estimated costs of the Fox Bottom sediment control reservoir are included in Table 1-E.

The stream channels in the urban areas of Adena and Dillonvale would be cleaned of unsightly trash and debris. Stream banks which are eroding noticeably would be stabilized. Point sources of large volumes of solid mine waste would be controlled to minimize sediment volumes in the channels. Vegetative materials would be selected for qualities of erosion control, wildlife habitat enhancement, recreation usefulness and aesthetic pleasure. Selected grasses, legumes, shrubs, and trees would be established on the channel banks, berms, and adjacent odd areas.

The mine waste area on the right bank of Short Creek between Newtown and Dillonvale would be graded and

shaped and dressed with soil material, where practical, to minimize waste material movement into the channel. The soil material would be planted to vegetation for erosion control, wildlife habitat, and beautification.

About six miles of streams and adjacent areas would be modified. The estimated costs of the work are included in Table 1-E.

Impacts of Environmental Quality Plan

Sediment transport on Middle Fork would be reduced by about 1,700 acre-feet by the Fox Bottom reservoir during the project life. Sediment deposition in the lake, initially 100 acres in size, would first occur in the upstream end of the reservoir. It would gradually progress toward the dam with simultaneous reduction of lake volume and surface area. As the reservoir filled, the stream would reappear.

The total land needed for installation of the reservoir would be about 379 acres (approximately 84 acres of cropland, 179 of pasture, 93 of forest land, and 23 classified as other land).

The reservoir land subject to periodic inundation would supply hunting and picnicking areas. The sediment pool would support lake fishing activity.

The channel work in Adena, Dillonvale, and between Newtown and Dillonvale in the mine waste area could improve the visual quality of the landscape. About 80 acres would become available for park and recreational use.

Upon reaching maturity (4 to 8 years for some species, depending on soil qualities, fertilization, moisture, and other factors), these plants will furnish cover, food, and nesting areas of higher quality than that of most of the current habitat in the project area. Grasses and legumes will provide wildlife food and shelter about one year after planting. Wildlife displaced by channel work will gradually repopulate these areas as the plants grow and begin to furnish food and cover.

The planned conservation land treatment, sediment control reservoir, surface mine revegetation, channel vegetative plantings, stream bank stabilization and point source sediment control would reduce the average annual volume of sediment delivered to the Ohio River from the watershed by more than 6,300 tons.

Explanation of Costs

See Table 1-E for details of cost estimates.

Implementation

1. Implementation of Land Treatment Measures of Entire Watershed.
   a. Provide needed land treatment measures on 17,775 acres of farm land through an accelerated land treatment program.

   b. Vegetate 3,000 acres of abandoned (pre-law) surfacemined lands.

   c. Plant 500 acres of land adjacent to channels in 100-foot strips to act as filter strips.

   d. Improve terrestrial habitat by establishing 270 miles of permanent woody and herbaceous cover on farm and field boundaries.

2. Nonstructural Measures
   a. State, county, and local government authorities could be used for implementation.

3. Structural Measures
   a. These measures could be implemented through PL-566, administered by the Soil Conservation Service. Authorities provided through this act could be used to supplement authorities of the federal, state, county, and local agencies.

TABLE I-E
ESTIMATED PROJECT INSTALLATION COSTS
ABBREVIATED ENVIRONMENTAL QUALITY PLAN

Short Creek Watershed, Ohio

Sheet 1 of 2

Installation Cost Item	Acres to be Treated 1/	Estimated Cost (Dollars) 2/ Federal	Other	Total
LAND TREATMENT				
Soil Conservation Service				
Cropland	7,650		21,400	21,400
Pasture	9,625		546,300	546,300
Other Land	7,325		1,666,200	1,666,200
Technical Assistance		133,300	61,100	194,400
SUBTOTAL - SCS Asst.	24,600	133,300	2,295,000	2,428,300
Forest Service				
Forest Land	560		21,800	21,800
Technical Assistance			5,200	5,200
SUBTOTAL - FS Asst.	560		27,000	27,000
Special Measures				
Surface-Mined Land Revegetation	3,000		163,500	163,500
Tree and Shrub Plantings Near Channels	500		40,900	40,900
Technical Asst.		17,800		17,800
SUBTOTAL - Special Measures	3,500	17,800	204,400	222,200
TOTAL LAND TREATMENT	25,160	151,100	2,526,400	2,677,500
NONSTRUCTURAL MEASURES				
Flood Proofing (160 Buildings)				461,800
Flood Insurance				3,308,900 3/
Flood Plain Zoning				64,800 4/
TOTAL NONSTRUCTURAL MEASURES				3,835,500

1/ Non-Federal Land
2/ Price Base 1975
3/ $203,200 estimated annual cost capitalized at 6 1/8 percent interest for 100 year project life.
4/ $3,980 estimated annual administrative cost capitalized at 6 1/8 percent interest for 100 year project life.

March 1976

TABLE I-E
ESTIMATED PROJECT INSTALLATION COSTS
ABBREVIATED ENVIRONMENTAL QUALITY PLAN

Short Creek Watershed, Ohio

Sheet 2 of 2

Installation Cost Item	Estimated Cost (Dollars) 1/
STRUCTURAL MEASURES	
Construction	
Sediment Storage Reservoir	555,600
Channel Work (6 miles)	261,200
SUBTOTAL - Construction	816,800
Engineering Services	59,200
Relocation Payments	57,900
Project Administration	
Construction Inspection	185,000
Other	61,000
Relocation Advisory Assistance Services	1,300
SUBTOTAL - Project Administration	247,300
Other Costs	
Land Rights	161,700
TOTAL STRUCTURAL MEASURES	1,342,900
TOTAL PROJECT	7,855,900

1/ Price Base 1975

March 1976

PART III
DISPLAY OF ACCOUNTS FOR THE SELECTED PLAN

A display of the beneficial and adverse effects are given in the following pages for:

National Economic Development
Environmental Quality
Regional Development
Social Well-Being

SELECTED PLAN
SHORT CREEK WATERSHED
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT
Dollars 1/
(Average Annual)

Components	Measures of Effects	Components	Measures of Effects
Beneficial Effects		Adverse Effects	
A. The value of users of increased outputs of goods and services.		A. The value of resources required for a plan.	
		1. Single purpose reservoir and channel work.	
1. Flood Prevention	335,697		
2. Utilization of unemployed and under employed labor resources.		Project Installation (structural measures)	259,110
Project Construction and O & M	69,293	Project Administration	42,160
		O & M	21,650
Total Beneficial Effects	404,990	Total Adverse Effects	322,920
		Net Beneficial Effects	82,070

1/ Interest Rate - 100 years at 6 1/8 percent; Price Base 1975 for adverse and non-agricultural beneficial effects and adjusted normalized prices for agricultural beneficial effects.

March 1976

SELECTED PLAN
SHORT CREEK WATERSHED
REGIONAL DEVELOPMENT ACCOUNT

Dollars 1/
(Average Annual)

Components	Measures of Effects: State of Ohio	Measures of Effects: Rest of Nation
A. Income		
Beneficial Effects		
1. The value of increased output of goods and services to users residing in the region.		
a. Flood Prevention	335,697	-
b. The utilization of regional unemployed or underemployed labor resources.	69,293	-
c. Secondary	28,864	-
Total Beneficial Effects	433,854	-

Components	Measures of Effects: State of Ohio	Measures of Effects: Rest of Nation
A. Income		
Adverse Effects		
1. The value of resources contributed from within the region to achieve the outputs.		
a. Single purpose reservoir and channel work.		
Project Installation (structural measures)	29,920	229,190
Project Administration	5,370	36,790
O & M	21,650	-
Total Adverse Effects	56,940	265,980
Net Beneficial Effects	376,914	-265,980

1/ Interest Rate - 100 years at 6 1/8 percent; Price Base 1975 for adverse and non-agricultural beneficial effects and adjusted normalized prices for agricultural beneficial effects.

March 1976

SELECTED PLAN
SHORT CREEK WATERSHED
REGIONAL DEVELOPMENT ACCOUNT

Components	Measures of Effects: State of Ohio	Measures of Effects: Rest of Nation	Components	Measures of Effects: State of Ohio	Measures of Effects: Rest of Nation
B. Employment			B. Employment		
Beneficial Effects			Adverse Effects		
1. Increase in the number and types of jobs.			1. Decrease in number and types of jobs.		
a. Employment OM&R	1 permanent seasonal semi-skilled job.	-	a. Reduction in railroad, road and bridge damage.	.5 permanent semi-skilled equivalent.	-
b. Employment for project construction.	72 semi-skilled jobs for 1 year	-	b. Reduction in urban damage.	6 permanent semi-skilled equivalent.	-
Total Beneficial Effects	1 permanent seasonal semi-skilled job	-	Total Adverse Effects	6.5 permanent semi-skilled jobs equivalent.	-
	72 semi-skilled jobs for 1 year	-			
			Net Beneficial Effects	+1 permanent semi-skilled job.	-
				-6.5 permanent semi-skilled jobs equivalent	-
				+72 semi-skilled jobs for 1 year	-

SELECTED PLAN
SHORT CREEK WATERSHED
REGIONAL DEVELOPMENT ACCOUNT

Components	Measures of Effects Indiana Planning Region Number 13	Rest of Nation
C. Population Distribution		
Beneficial Effects	Creates 1 permanent semi-skilled job and 72 semi-skilled jobs for 1 year in an economically depressed area that is having a slight loss in population.	--
Adverse Effects	Creates a loss of 6.5 permanent semi-skilled jobs equivalent due to a reduction in flood water damage.	--
D. Regional Economic Base and Stability		
Beneficial Effects	Average employment effects the same as in C - population distribution, but stability to the economic base as flood hazards are reduced.	--

SELECTED PLAN
SHORT CREEK WATERSHED
ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of Effects
Beneficial and Adverse Effects	
A. Areas of Natural Beauty	1. Reduce average annual streambank erosion by 450 tons, or 13 percent, and reduce sediment yield from streambank erosion by 248 tons, or 12 percent.
	2. Improve general watershed aesthetics.
	3. Change land uses permanently on seven acres to dam, spillway, and outflow areas and eventually change land uses permanently on 68 acres to wet sediment pool.
B. Quality Considerations of Water, Land, And Air Resources	1. Increase slightly the base flows of perennial streams except during periods of prolonged drought.
	2. Reduce infertile overwash and debris accumulations associated with flooding.
	3. Increase dust, exhaust gases, and noise during construction of dam and channel work.

4. Reduce area flooded from 709 acres to about 343 acres for the two year frequency floods and from 1,424 acres to 830 acres for the 100-year frequency event.

5. Reduce peak flow rates for the 2, 10, and 100-year frequency floods by 8, 24, and 37 percent, respectively, at the outlet of the project area.

6. Reduce the possibilities of injury and loss of life due to drowning and contamination of water supplies.

7. Improve infiltration of water into soil by certain land treatment measures which will reduce flood peaks and damages by two to three percent.

8. Remove water from poorly drained cropland and pasture land by land treatment drainage measures, some of which will also supply water to ponds for recreation and livestock uses.

9. Induce flooding in the dry sediment pool area of the reservoir and perhaps increase sedimentation and alter the flow patterns of the dry sediment pool.

10. Increase normal depths and water velocities and change stream bottom compositions on 10.0 miles of streams.

11. Increase conservation farming systems and farming efficiency on 9,625 acres of pasture land, 7,650 acres of cropland; increase the level of forest land management on 560 acres; and improve water management and cover conditions on 7,300 acres of miscellaneous land.

12. Reduce soil erosion which will reduce the total average annual sediment yield of the watershed to the Ohio River by 6,300 tons (a 12 percent reduction).

13. Reduce the average annual suspended sediment concentration by about 48 parts per million (a 12 percent reduction).

14. Temporarily increase erosion, sedimentation and turbidity during construction of the channel work and reservoir, adversely affecting aquatic life habitats.

15. Destroy 47 acres of woody vegetation by channel work until wildlife planting can be established.

16. Reduce stream turbidity and reduce the covering effect of sedimentation on aquatic habitats.

17. Improve water quality by reducing erosion and sedimentation, by installing animal waste disposal facilities, and by reducing inundation of private water supplies and waste disposal systems.

C. Biological Resources and Selected Ecosystems

1. Temporarily reduce the population of game birds, song birds, mammals, and other terrestrial creatures where channel work disturbs streamside vegetation until the flora has been restored.

2. Reduce Type 1 wetlands (which provide temporary habitat for a wide variety of birds, mammals, and other wildlife) by 342 acres, a 52 percent reduction.

3. Drain one farm pond (about 0.5 acre in area) and forego the aquatic habitat and recreational values therein.

4. Possibly block migration of American eels, by means of the reservoir, up the Middle Fork of Short Creek.

5. Change stream flow durations after storms.

6. Create wildlife habitat on about 47 acres, including 51,600 feet of border, by planting trees, shrubs, and grasses especially suited to provide wildlife food and shelter.

7. Temporarily reduce the populations of fishes, amphibians, aquatic invertebrates, and other aquatic life in the channel work areas until these areas return to more natural conditions.

8. Increase and decrease water temperatures in various areas of the watershed's streams.

9. Create mosquito breeding areas in the flood-retarding reservoir.

10. Reduce mosquito production by reducing flooding and improving field drainage.

11. Periodically disturb the agricultural, wildlife and recreational uses on 276 acres in the detention pool of the reservoir.

12. Change the natural pool-riffle configurations and remove aquatic flora, logs, and other cover for aquatic life from 10.0 miles of streams.

13. Improve and increase wildlife food and shelter conditions on about 4,400 acres; and create habitats for aquatic vertebrates and invertebrates at eight ponds and eventually at the one flood-retarding reservoir.

14. Periodically or permanently inundate 14,800 feet of natural stream conditions which would change or forego the stream habitats for aquatic life, stream values for other wildlife, stream fishing values and aesthetics.

D. Irreversible or Irretrievable Commitments

1. Convert 645 acres (cropland, 130 acres; pasture land, 184 acres; forest land, 140 acres; and other land, 191 acres) to: (a) reservoir, dam site, spillway, outflow areas and borrow areas (379 acres) and (b) 266 acres of channel work areas.

2. Preclude mining of an economically extractable coal seam under the flood control reservoir.

SELECTED PLAN
SHORT CREEK WATERSHED
SOCIAL WELL BEING ACCOUNT

Components	Measures of Effects
Beneficial and Adverse Effects	
A. Real Income Distribution	1. Creates 1 permanent seasonal semi-skilled job and 72 semi-skilled jobs for one year equivalent for project construction.
	2. Loss of 6.5 permanent semi-skilled job equivalent with reduction of flood water damages.
B. Life, Health, and Safety	1. Provide flood protection from the 100-year storm for existing urban structures.

PART II

ENVIRONMENTAL IMPACT STATEMENT

SHORT CREEK WATERSHED
Harrison and Jefferson Counties, Ohio

USDA-SCS-EIS-WS-(ADM)-73-17-(F)-OH

The Short Creek Watershed Project

Harrison and Jefferson Counties, Ohio

Final Environmental Impact Statement

Robert E. Quilliam
State Conservationist
Soil Conservation Service

Sponsoring Local Organizations

Short Creek Watershed Conservancy District
Main Street
Adena, Ohio 43901

Dillonvale Village Council
Dillonvale, Ohio 43917

Adena Village Council
Adena, Ohio 43901

Harrison Soil and Water Conservation District
239 East Warren Street
Cadiz, Ohio 43907

Jefferson Soil and Water Conservation District
P.O. Box 1207
Steubenville, Ohio 43952

Jefferson County Board of Commissioners
Courthouse
Steubenville, Ohio 43952

April 1976

PREPARED BY:

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service
311 Old Federal Building
Columbus, Ohio 43215

USDA ENVIRONMENTAL IMPACT STATEMENT

The Short Creek Watershed Project
Harrison and Jefferson Counties, Ohio

Prepared in Accordance with
Sec. 102(2)(C) of Public Law 91-190

Summary Sheet

I. Final

II. Soil Conservation Service

III. Administrative

IV. Description of Project Purpose and Action

A project for watershed protection and flood prevention in Harrison and Jefferson Counties, Ohio, to be implemented under authority of the Watershed Protection and Flood Prevention Act (PL 566, 83rd Congress, 68 Stat., 666), as amended. Project measures consist of conservation land treatment on about 25,000 acres, one floodwater retarding reservoir, and 10.0 miles of stream channel work.

V. Summary of Environmental Impacts Including Favorable and Adverse Environmental Effects

Conservation land treatment measures will increase farming efficiency and reduce erosion on 9,625 acres of pastureland and 7,650 acres of cropland. Forest land management on 560 acres will improve timber stands and reduce erosion. Improved water management and cover conditions on 7,325 acres of miscellaneous land will reduce erosion and runoff. The project will reduce average annual sediment concentration in watershed streams by 12 percent.

Structural measures will reduce the area flooded from 709 acres to about 143 acres for the two-year frequency floods and from 1,424 acres to 830 acres for the 100-year frequency event. This will result in the reduction of damages to 86 businesses and 531 homes by 95 percent,

the reduction of damages to transportation facilities by 85 percent, and a reduction of average annual agricultural damages by 33 percent. Economic growth will be encouraged and seasonal employment opportunities will be increased.

Natural conditions, fishing opportunities, and vertebrate and invertebrate habitats will be eventually foregone on an estimated 2.2 miles of streams which will be occupied by the embankment and 68-acre sediment pool of the reservoir. These values will be periodically affected on an estimated additional 5.8 miles of streams due to floodwater storage in the reservoir.

Structural measures will destroy or periodically inundate present land uses on an estimated 645 acres. The modified channel will permanently occupy about 266 acres and the reservoir will change land uses on seven acres to dam, spillway, and outflow areas. Some 58 acres within the borrow and other work areas will be temporarily disturbed. The remaining 314 of the 645 acres will be periodically inundated by floodwaters within the reservoir. When water pollution has been sufficiently abated in the Middle Fork of Short Creek, water will be impounded behind the Fox Bottom floodwater retarding structure, creating 68 acres of aquatic habitat.

Physical and biological conditions and habitats on 10.0 miles of stream will be temporarily or permanently altered by channel work. Erosion, sedimentation, and turbidity will be temporarily increased during channel and reservoir construction.

Type 1 wetlands will be reduced by 342 acres as a result of structural measure installation.

Temporary increases in air and noise pollution will be created by machinery during the project construction period.

VI. List of Alternatives Considered

1. Accelerated conservation land treatment and eight reservoirs without channel work.

2. Accelerated conservation land treatment and three miles of channel work.

3. Accelerated conservation land treatment.

4. Accelerated conservation land treatment and flood plain land use control.

5. Accelerated conservation land treatment and flood-proofing.

6. Accelerated conservation land treatment and flood insurance.

7. Accelerated conservation land treatment, eight reservoirs, flood plain use regulations, and flood proofing.

8. Accelerated conservation land treatment and flood plain purchase.

9. No project.

VII. Federal, State, and Local Agencies from Which Written Comments Have Been Received

Department of the Army
Department of Commerce
Department of Health, Education, and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency*
Ohio Environmental Protection Agency 1/
Office of the Governor (Ohio),
  Planning and Development Clearinghouse 2/
Appalachian Regional Commission
Brooke-Hancock-Jefferson
  Metropolitan Planning Commission 3/
Ohio Audubon Council and National Audubon Society

VIII. The draft environmental impact statement was received by the Council on Environmental Quality on January 29, 1973.

1/ Governor's Designated Agency
2/ State Clearinghouse
3/ Areawide Clearinghouse
*Represents consolidated comments

PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

USDA SOIL CONSERVATION SERVICE FINAL
ENVIRONMENTAL IMPACT STATEMENT

for

A. SHORT CREEK WATERSHED, OHIO

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83rd Congress, 68 Stat. 666, as amended.

B. SPONSORING LOCAL ORGANIZATIONS

<u>Short Creek Watershed Conservancy District</u>

<u>Dillonvale Village Council</u>

<u>Adena Village Council</u>

<u>Harrison Soil and Water Conservation District</u>

<u>Jefferson Soil and Water Conservation District</u>

<u>Jefferson County Board of Commissioners</u>

C. PROJECT PURPOSES AND GOALS

1. <u>Watershed Protection (Conservation Land Treatment)</u>

Watershed protection will be achieved through the application of resource management systems for cropland, pastureland, woodland, and other land. These resource management systems include conservation practices needed to achieve a minimum quality standard in the natural resource base for sustained use. Some landowners have chosen to apply additional practices that will improve quality in the environment as well as quality in the standard of living.1/

1/ All information and data in this statement, except as otherwise noted by reference to source, were collected during watershed planning investigations by the Forest Service and Soil Conservation Service, U.S. Department of Agriculture.

Goals have been established to achieve this quality through the application of the conservation program listed on the following page.

2. Flood Prevention

The project is designed to reduce the flooded areas as shown below:

Table A
Reductions of Flooded Areas for Certain Flood Frequencies

Flood Frequency	Acres Flooded Without Project	Acres Flooded With Project	Percent Reduction of Flooded Area
100-year	1,424	830	41.7
3-year	914	447	51.1
2-year	706	343	51.4

Reductions in flood stage for the 100-year storm in areas of channel work are shown in Table B.

Table B
Flood Stage Reductions in Areas of Channel Work

Reach Description	Avg. Stage Reduction
Short Creek from upstream end of channel work to jct. North Fork in Adena.	3.0 ft.
Short Creek in Adena from North Fork to downstream end of channel work in this area.	3.3 ft.
North Fork in Adena from upstream end of channel work to jct. Short Creek.	4.9 ft.
Short Creek in Dillonvale area from upstream end of channel work to jct. Piney Fork.	8.0 ft.
Piney Fork in Dillonvale from upstream end of channel work to jct. Short Creek.	3.7 ft.

Conservation Land Treatment

GOALS	UNITS
Soil and Water Conservation District Cooperators	168 on 26,800 acres
Conservation Plans	125 on 20,000 acres
Revised Conservation Plans	24 on 3,840 acres
Conservation Cropping Systems	2,000 acres
Brush Management	1,500 acres
Contour Farming	2,500 acres
Inventories and Evaluations for Individual Units of Land	50
Inventories and Evaluations for Units of Government	5
Critical Area Planting	1,400 acres
Crop Residue Management	6,300 acres
Diversions	7,500 feet
Debris Basins	3
Ponds	8
Fishpond Management	8 ponds
Livestock Exclusion	560 acres
Minimum Tillage	400 acres
Pasture and Hayland Management	7,000 acres
Pasture and Hayland Planting	1,500 acres
Pipelines	2,000 feet
Recreation Area Improvement	15 acres
Recreation Land Grading and Shaping	5 acres
Recreation Trails and Walkways	1,000 feet
Spring Developments	80
Contour Stripcropping	250 acres
Subsurface Drains	700 feet
Tree Planting	280 acres
Troughs or Tanks	100
Wildlife Upland Habitat Mgt.	3,000 acres
Woodland Improvement	280 acres
Land Adequately Treated	10,000 acres
Land Protected During Development	15 acres

Monetary benefits from floodwater and sediment reductions for valley segments, which include the urban areas, are tabulated for selected reaches in Table C. Agricultural damages will be reduced by about 33 percent.

Table C
Damage Reductions

Reach Description	Avg. Annual Damages Without Project (Dollars)	Avg. Annual Damages With Project (Dollars)	Damage Reduction (Percent)
North Fork a/	22,613	1,943	91.3
Short Creek b/	88,365	7,300	91.7
Short Creek c/	54,583	4,326	92.1
Short Creek d/	148,502	526	99.6
Piney Fork e/	26,305	29	99.9

a/ From Rose Valley to Short Creek in Adena.
b/ From South Fork to North Fork in Adena.
c/ From North Fork in Adena to Perrin Run.
d/ From Long Run in Newtown Area to Piney Fork in Dillonvale.
e/ From upstream end of residential development to Short Creek in Dillonvale.

3. Drainage and Irrigation

One of the goals of the conservation land treatment phase of the project is to improve surface and subsurface drainage to upgrade land for general agricultural crops. Since the major streams in the watershed are generally deep enough and large enough for gravity drainage outlets, channel work for drainage is not planned.

Type 1 wetlands (seasonally flooded basins or flats) in the watershed will be reduced in channel work areas from 661 acres to 319 acres.

Since agricultural irrigation is not currently practiced and is not expected to become an important practice in the near future, irrigation improvement has not been included as a purpose of this project.

4. Fish and Wildlife and Recreation

The goals of the Project Sponsors and the Soil Conservation Service regarding plant and animal resources are: (1) to develop the project with a minimum of adverse environmental impacts, (2) to mitigate insofar as possible damages to the aquatic and terrestrial habitats resulting from the project, (3) to enhance the aquatic and terrestrial habitats in the watershed. Specific construction and maintenance techniques will be used to help minimize the adverse impacts on the environment. Mitigation measures will include the planting of trees and shrubs especially suited to provide wildlife food and shelter, and the construction of a "v"-shaped channel bottom to concentrate low flows in the sections of Short Creek to be modified. Enhancement of the aquatic and terrestrial habitats will result from land treatment measures including pond construction, tree and shrub plantings, grass plantings, and management and structural measures for the reduction of erosion and sedimentation.

Due to significant water pollution at the proposed floodwater retarding reservoir site in the watershed, recreation is not a goal of this project.

Farm pond construction and wildlife habitat development resulting from the conservation land treatment phase of the project will create incidental recreation in the forms of fishing, picnicking, hunting, birding, and other activities.

5. Municipal, Industrial, and Rural Water Supply

Watershed communities have found the most desirable source of water to be pipelines from outside the watershed. Therefore, no surface impoundments for municipal or industrial water supplies are planned for the project.

The project's conservation land treatment phase is designed to provide technical assistance to farm operators for installing farm ponds and developing springs for water supplies.

D. PLANNED PROJECT

1. Conservation Land Treatment Measures

Land treatment measures included in this project are necessary for the conservation, development, and improvement of the agricultural land. The measures will be planned and applied in cooperation with the Harrison and Jefferson Soil and Water Conservation Districts. Technical assistance for planning and installing these measures for individual landowners will be provided by the Soil Conservation Service. The Ohio Division of Forestry and Reclamation, in cooperation with the U.S. Forest Service, will provide technical assistance for installing the forestry practices.

Soil and water conservation practices planned to adequately treat 25,160 acres throughout the project area include the following:

Cropland - About 7,650 acres of cropland are planned for treatment in the project. All cropland will have conservation cropping systems which will include these practices where applicable: contour stripcropping, crop residue management, diversions, minimum tillage, contour farming, and subsurface drains.

Pasture and Hayland - About 9,625 acres of pasture and hayland are planned for treatment. Planned conservation practices will provide excellent cover for areas subject to erosion, good forage production for livestock, and water distribution for livestock use. The conservation practices, planned where needed, include pasture and hayland planting and management, spring developments, troughs or tanks, brush management, and pipelines.

Forest Land - Improved management of forest land will include 560 acres of such measures as tree planting, woodland improvement, and livestock exclusion. Fire protection will continue to be provided for all forested areas in the watershed.

Other Land - The 7,325 acres of miscellaneous land to be treated include farmsteads, privately-owned unreclaimed surface-mined land, rural homesteads, and odd

areas. Soil conservation practices, planned where needed, include critical area planting, ponds, wildlife upland habitat management, fishpond management, debris basins, disposal lagoons, and recreation area improvement.

There is presently no formal land use plan for the project area. Although this project will provide protection to existing development in the flood plain, the Sponsors are urged to enact ordinances to prohibit further development in flood hazard areas.

At least once each year the Sponsoring Local Organizations will publish information about the areas flooded by the 100-year storm. This will create a greater flood hazard awareness. The Sponsors will prevent (to the extent possible) reconstruction and new developments in the areas which are subject to flooding by the 100-year event. The Ohio Department of Natural Resources will assist the Sponsors in developing flood plain land use controls.

2. Structural Measures

One flood prevention reservoir and 10.0 miles of stream channel work are planned for the project as shown on the project map, Appendix B. Figure 1 shows features typical of those of the Fox Bottom Reservoir, and Figure 2 shows a typical cross section and perspective sketch of the modified channel. Appendix E shows channel profiles indicating bottom widths and depths of modified channels and flood elevations with and without the project.

The structural measures will be designed to function for 100 years and will contain design features to help minimize or counteract disturbances to the existing environment. The Short Creek Watershed Conservancy District will enter into contracts for installing structural measures and provide the inspection and similar services that they consider necessary to protect their interests. The Soil Conservation Service will provide engineering and administrative services, including a share of relocation payments for persons and businesses displaced by the Fox Bottom reservoir. The Conservancy

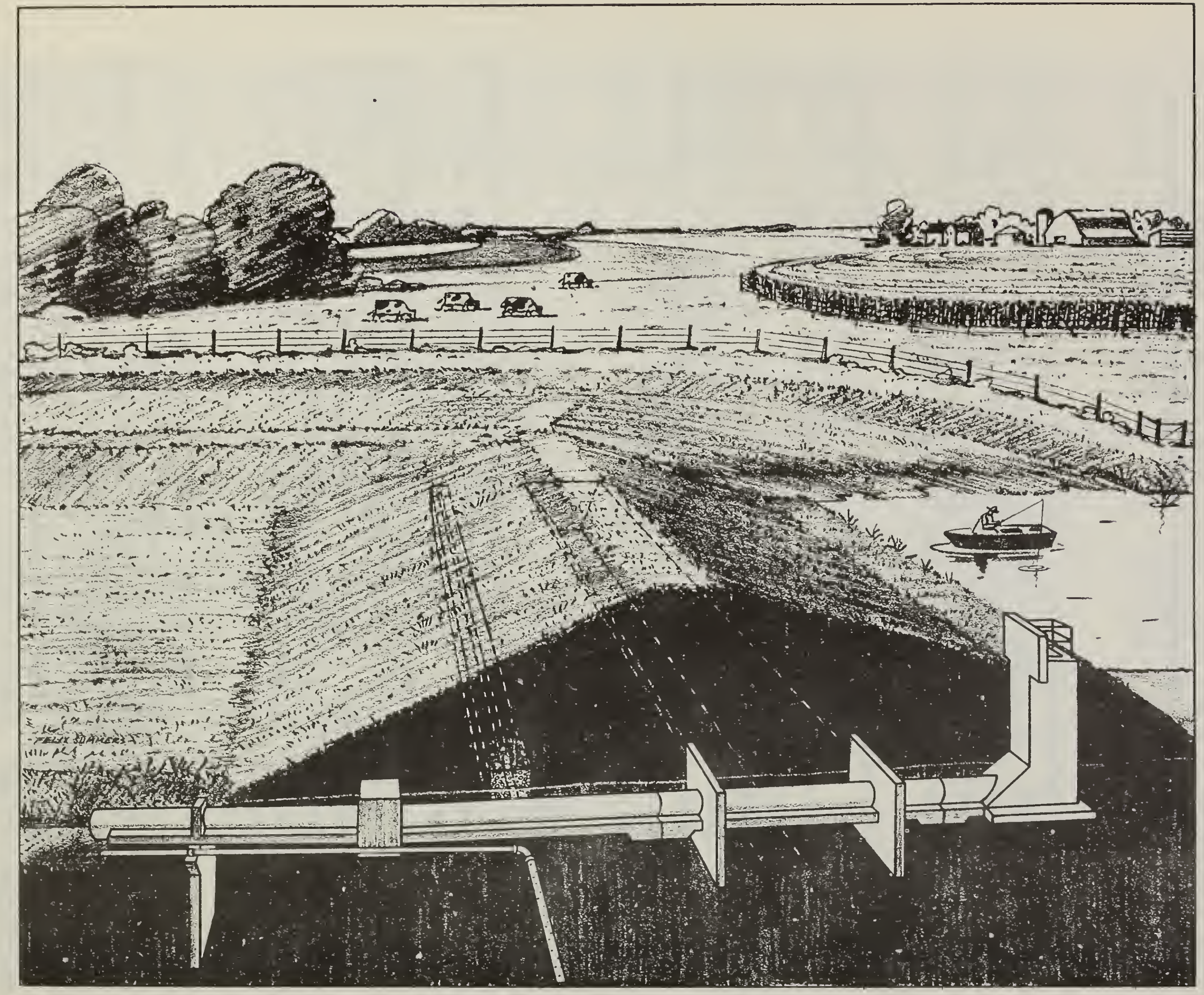

Figure 1 1 of 2

Earth fill dam with concrete drop inlet and conservation pool.

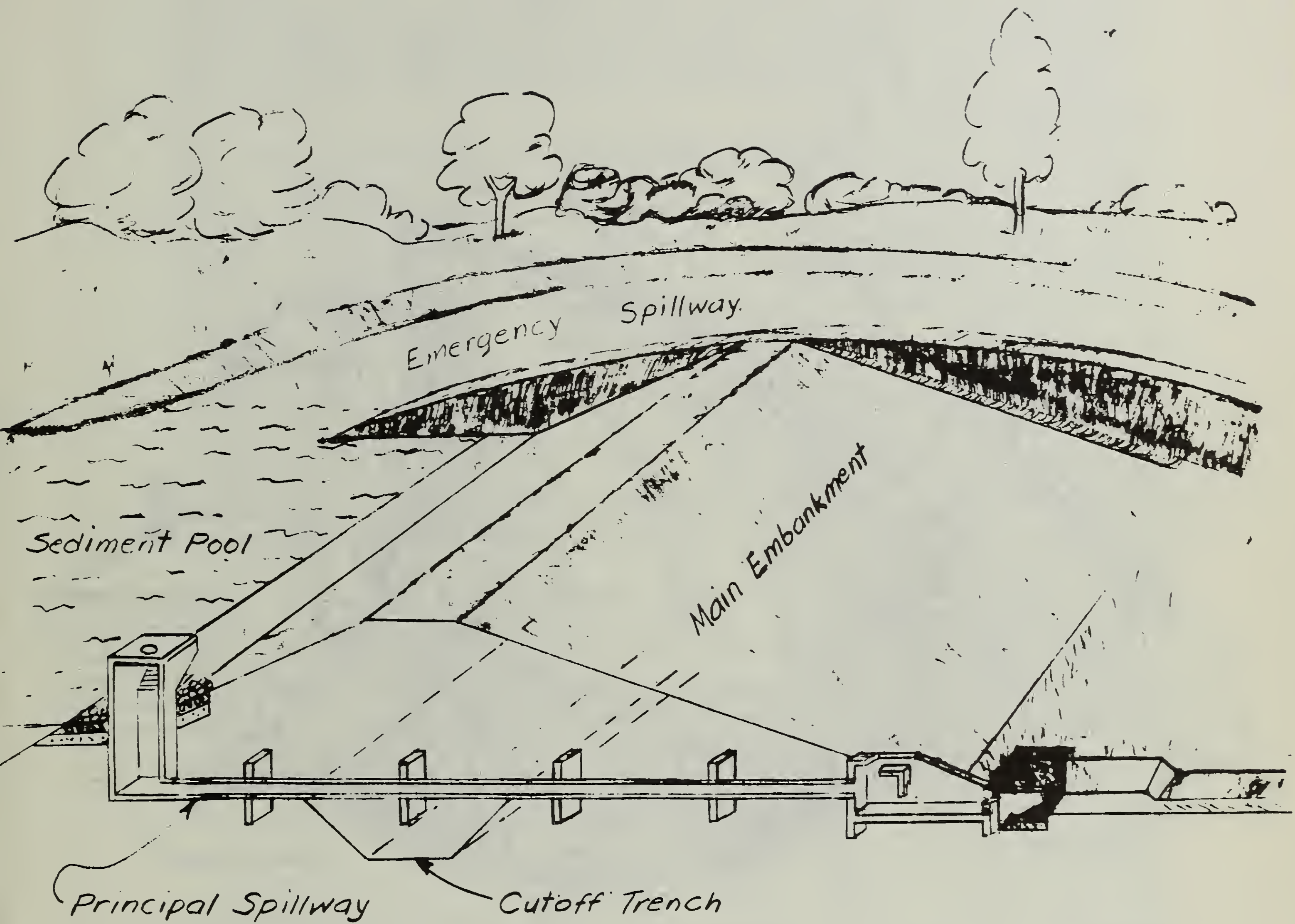

FIGURE 1

2 OF 2

Cross Section and Perspective View
Showing Typical Features of
Dam, Emergency Spillway
and
Sediment Pool Impoundment

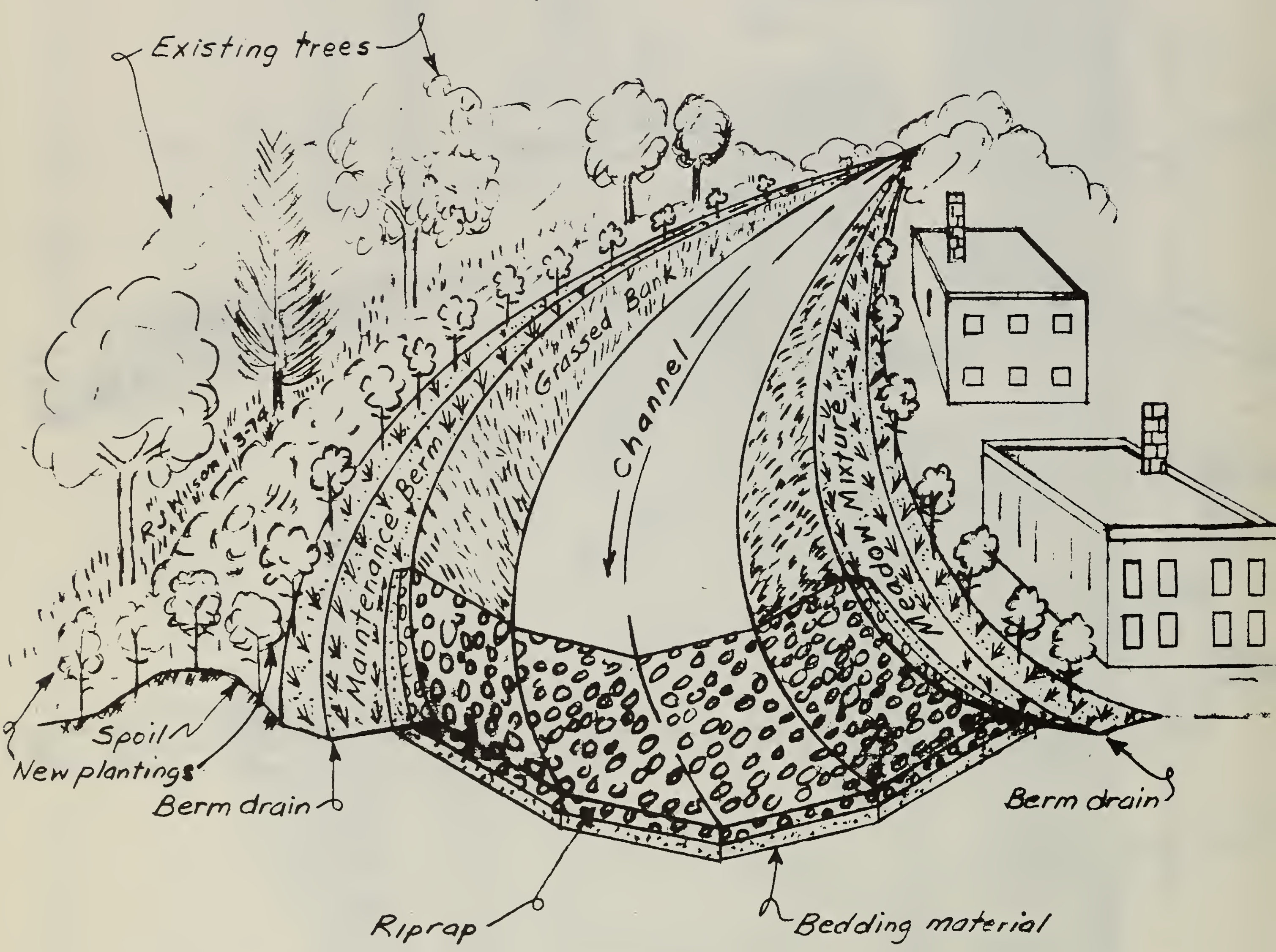

FIGURE 2

Cross Section and Perspective View of Modified Channel
Showing
Typical Segment with Riprap Protection
Typical Segment with Vegetated Channel Banks
Provisions for Low Water Flows
and
Replanting Details

District will use its dominant rights of eminent domain when needed to acquire land rights for installation, operation, and maintenance of structural measures. Appraisals will be obtained as a prerequisite to securing land rights in accordance with provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894).

The Ohio Historical Society has conducted an archaeological reconnaissance survey of the proposed structure sites and prepared a report for the Soil Conservation Service. The survey included a literature search of local historical records, consultation with persons familiar with the area's historical and archaeological values, and onsite inspections of the area. 1/

The survey revealed three sites of archaeological interest in the Fox Bottom Reservoir area and one site near Deyarmonville in the area of channel work downstream from Dillonvale. Two remnants of historic structures in the Adena channel work area were disclosed. 2/

The Society recommended further investigation of the four archaeological sites, but considered the two historic remnants unworthy of preservation. The Soil Conservation Service negotiated another contract with them for more detailed studies of the archaeological sites in question. Based on the results of these studies, the Ohio Historical Society concluded that no areas of historical or archaeological value would be affected by the Short Creek Watershed Project. None of the sites are recommended for nomination to the "National Register of Historic Places," nor are any sites in the area of proposed structure sites currently listed in the National Register. 3/

The Soil Conservation Service will notify the Secretary of the Department of the Interior of the evidence of archaeological sites and materials in the Fox Bottom Reservoir area. Other provisions of Public Law 86-523,

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1/ "An Archaeological Survey of the Short Creek Project Area, Harrison and Jefferson Counties, Ohio," by Martha Otto, Ohio Historical Society, Columbus, Ohio, April 2, 1974.

2/ Ibid.

3/ Ibid.

relating to preserving historical and archaeological sites in the areas of construction, will be followed before and during construction.

Any discoveries during construction work will be promptly reported to the State Historic Preservation Officer. Disposition or preservation of sites and materials will be joint decisions of the agencies involved. Other provisions of Public Law 89-665, relating to preserving historic properties, will be followed before and during construction.

During project construction, repair and maintenance operations, all state and local health and air and water quality regulations will be observed. Construction contractors will be required to use methods that minimize erosion and sedimentation and that safeguard air quality.

Borrow areas will be stripped of vegetation and topsoil only as needed. The steepness of cut slopes in borrow areas will be limited to reduce erosion. Generally, finished slopes will not be steeper than 25 percent. The borrow areas will be graded to prevent ponding. Haul roads will be watered if necessary to minimize dust. Stripping, clearing, and other disturbances will be limited to areas necessary for efficient construction operations. Prior clearing of borrow areas will be limited to fill material requirements for about one week's work.

Disturbed areas will be seeded as soon as practicable after other construction activities are completed. Any areas subject to long delays in construction work will be temporarily seeded. When prolonged weather conditions become unfavorable for successful seedings, construction will be stopped or exposed areas will be mulched.

Construction contractors will be required to limit the concentration of sediments and other pollutants in water flowing from construction areas. Debris basins or other measures will be used as necessary.

The reservoir will have storage volumes reserved for sediment, floodwater, design safety, and economies,

including freeboard. The volume reserved for sediment will be equivalent to the expected accumulation in 100 years.

The dam will be designed to impound a 68-acre lake, equivalent in volume to the estimated submerged sediment deposition during the first 50 years of reservoir life. Due to unsatisfactory water quality, the lake will remain drained until a satisfactory impoundment can be made. The local Project Sponsors and the Ohio Environmental Protection Agency will collaborate in determining when the stream water is of suitable quality for storage in the sediment pool. The Ohio Department of Health reports that the water flowing into the sediment pool area is currently unsuitable for domestic water supply, fishing, or body contact recreation. 1/ Accordingly, the Project Sponsors will take actions to prevent such uses until water pollution in this area has been abated.

At the end of the first 50-year period, the lake level may be raised approximately nine feet to impound an area equal in volume to the estimated submerged sediment deposition for 100 years. The base of the principal spillway riser will be designed to accommodate the riser modification needed to change the lake level. If this change is made, a 100-acre lake will be created.

The volume reserved for floodwater will contain the expected runoff from the 100-year storm. The volume needed for design economy will reduce the amount of excavation required for the emergency spillway. The freeboard volume will help safeguard the embankment and spillways during unusual storm events.

The principal spillway will be a precast reinforced concrete conduit with a vertical drop inlet concrete riser and an energy-dissipating outlet. The riser will rest on a rock foundation unless final investigations reveal conditions not encountered in preliminary geologic investigations. The land surface in the principal spillway and embankment foundation areas generally lies ten feet or less above rock.

1/ Information received in letter from A.L. Fishback, Engineer-in-Charge of the Water Supply Unit, Division of Engineering, Ohio Department of Health, to William H. Wehr of the law firm Fairfield, Wehr, Moreland, and England, Steubenville, Ohio, August 21, 1968.

The emergency spillway is classified as "rock," and excavation is expected to expose sandstone, limestone, shale, and coal and to end in or near the Morgantown sandstone member of the Conemaugh Formation. The bottom of the spillway will be backfilled with earth materials and vegetated to protect soft rocks from accelerated surface weathering and erosion. Final design studies may dictate a revised emergency spillway design to assure its satisfactory performance during design flows. The emergency spillway will have less than a one percent chance of operating in any given year.

The embankment will have a zoned fill design, using silty clays from nearby valley bottom and upland borrow areas and materials excavated from the emergency spillway. Proportions and placement of fill materials will be determined by final investigations, analyses, and designs.

About 93 acres will be cleared of woody vegetation in the embankment, spillway, borrow, and 50-year sediment pool areas.

The minimum land rights required for reservoir construction are shown in Table D. Present land use estimates for each area, except mineral rights, are also shown.

The Lower Freeport No. 6A coal lies approximately 480 feet beneath the dam and pool areas. This seam averages 40 inches in thickness and is considered mineable. In order to protect the dam and spillway area from possible damage from subsidence which could occur after mining, mineral rights will be acquired on approximately 26 acres (includes three acres in the flood pool) of land surrounding the dam and spillway area. Mineral rights will also be obtained on the remaining area to be covered by the flood pool, 273 acres, in order to eliminate the possibility of future mining activities, possible subsidence of the pool area, and the Sponsor's liability for potential flooding of these operations.

Seven rural family dwellings, two owner-operated farm operations, one rental farm operation, and one mobile home resident will be displaced by the reservoir. It

Table D

Present Land Uses and Land Rights Required for Reservoir Construction

Reservoir Use Description	Total Area Required (Acres)	Present Land Use (Acres)			
		Crop-land	Pasture Land	Forest Land	Other
Permanent Surface Use a/					
100-year Sediment Deposition Area (includes 50-year sediment pool).	100	14	51	25	10
Area Periodically Inundated	176	40	88	36	12
Subtotal (Detention Pool)	(276)	(54)	(139)	(61)	(22)
Dam, Spillways, and Outflow Area	7	4	0	3	0
Flowage Rights b/	38	2	21	14	1
TOTAL	321	60	160	78	23
Temporary Surface Use a/					
Borrow and Other Construction Areas	58	24	19	15	0
Permanent Subsurface Use					
Mineral Rights c/	299				

a/ The area shown for each use in this category is the area not overlapped by another surface use. For example, the sediment pool area does not include the area of the upstream portion of the dam (embankment) that is expected to be covered with sediment.

b/ Surface area lying between the water surface at the beginning emergency spillway flow and the maxium water surface level during passage of the emergency spillway design hydrograph.

c/ Most of the area is also needed for permanent and temporary surface use.

is anticipated the owner-operated farm operations are expected to go out of business. All the occupants will be relocated in housing considered decent, safe and sanitary according to the Uniform Relocation Assistance and Land Acquisition Policies Act of 1970. Adequate housing is available locally to serve all displaced persons.

About 19,000 feet of County Road 15, which parallels the Fox Bottom valley, will be permanently or periodically inundated by the reservoir. The Short Creek Watershed Conservancy District will acquire the right to close the road by written permission or court order as provided by Section 6101.17 of the Ohio Revised Code. A new state highway is proposed in Fox Bottom to replace County Road 15. Three alternative routes have been proposed. Two proposed routes would not be flooded by the reservoir, but their fill volumes would encroach on the reservoir storage volume. The maximum reservoir storage reduction would be about three percent, and this loss can be compensated for by a slightly modified reservoir design.

Township Roads 77, 78, and 79, which are generally perpendicular to the valley, will also be affected at their intersections with County Road 15. Township Road 77 has no outlet about one mile north of Fox Bottom and serves as access to no dwellings. Township Road 78 connects with paved roads about one mile south and 2.5 miles north of Fox Bottom. Township Road 79 connects with an improved road about one mile north of Fox Bottom.

Township Roads 77, 78, and 79 are recommended for connection with the future location of State Route 150 in designs prepared by Rackoff Associates, Columbus, Ohio, consulting engineers. It is anticipated that the decisions of local highway officials and the Ohio Department of Transportation will be according to the design recommendations of Rackoff Associates. If the roads are not connected, disruption of through traffic will be minimal because of nearby alternate routes. If they are connected with the new state route, traffic circulation will be essentially unchanged by the reservoir.

Grasses will be established on the dam and emergency spillway areas. Borrow and other areas disturbed by construction will be replanted to vegetation suitable for erosion control and wildlife habitat. Project Sponsors will determine the uses of land in the detention pool and flowage rights areas. (The uses will be compatible with the floodwater retarding purpose of the reservoir.) Much of the reservoir land infrequently flooded is expected to remain suitable for wildlife habitat. If water is impounded in the sediment pool, 68 acres of lake habitat will replace the stream habitat on about 2.2 miles of channel which will be displaced by the dam, spillway, and sediment pool.

Channel segments to be modified by the project flow through rural and urban areas. The modifications are extended downstream from Adena and Dillonvale far enough to minimize the effect of downstream high water on the urban areas. Land use along channel work areas is indicated in Table E. Some agricultural land lies in the channel work area near Adena, Olszeski Town, and Dillonvale.

The excavated channels will have primarily cohesive bank materials such as silty clays and noncohesive bed materials such as fine to medium sub-rounded pebbles and some cobbles. The excavation on Short Creek in Adena upstream from North Fork is expected to extend to the top of or partly into limestone bedrock. A segment of excavation about 500 feet long on North Fork in Adena is expected to expose bedrock in the modified channel bottom. All other modified channel bottoms are expected to contain mostly sand, gravel, and cobbles.

The extent and locations of project channel work are shown on the channel profiles, Appendix E, and on the Project Map, Appendix B.

The channel work consists of enlargement and minor realignment of the flow areas. Appurtenant surface water control features are part of the designs, as are spoil placement and management plans and wildlife habitat development.

Table E

Land Use Affected by Channel Work

Modified Channel Segment	Estimated Land Uses Adjacent to Channel Work in Acres Affected by Channel Modification							
				Other				
	Cropland	Pasture	Forest Land	Farmstead and Residential	Commercial Industrial and Civic	Mine Waste	Urban Open Land (Vacant)	Total
North Fork in Adena	6	3	6	15	0	0	0	30
Short Creek in Adena	10	2	10	19	1	2	0	44
Piney Fork In Dillonvale	0	0	0	32	0	0	0	32
Short Creek in Newtown, Olszeski Town, and Dillonvale	30	0	31	54	18	22	5	160
TOTAL	46	5	47	120	19	24	5	266

Local records reveal no previous major channel work in the areas of proposed construction. Limited channel changes have been made at highway bridges and where channel migration has threatened roadways and other works. A stream segment about 1500 feet long in the Second Street bridge area on Short Creek at Dillonvale has been cleaned every two or three years to benefit the village water department. The work consists of removing gravel bars and other accumulations from the channel bottom and spreading the materials near the channel. Individual property owners have made minor channel changes to correct erosion, shorten spans for bridges, or increase the size of building sites. There have been no known channel changes for lowering floodwater elevations.

The minimum land area needed to install and maintain the channel work is shown in Table F.

Table F
Minimum Land Area Requirements for Channel Work

Modified Channel Segment	Minimum Land Area Requirements in Acres		
	Permanent a/	Temporary b/	Total
North Fork in Adena	10	20	39
Short Creek in Adena	20	24	44
Piney Fork in Dillonvale	12	20	32
Short Creek in Newtown, Olszeski Town, and Dillonvale.	67	93	160
TOTAL	109	157	266

a/ Includes land voided by increased channel width, berms, travelways for maintenance, restored wildlife habitat areas, areas around appurtenances, spoil deposition areas where needed for wildlife plantings, and other permanent use areas. Land use by the existing channel in the segments to be modified (about 86 acres) is not included.

b/ Area needed temporarily for contruction, including spoil placement areas.

Channel work at bridges and along roads is designed for protection of facilities and for minimal erosion. The planned road and bridge modifications are described in Table G. All construction costs will be borne by Public Law 566 funds except those marked with an asterisk(*).

New State Route 150 is planned to cross Short Creek near the upstream end of the Dillonvale Village limits. The designs for the new road are being correlated with those for the planned project structural measures, and no modifications to the new road or bridge are anticipated.

The channel work is designed for stability with the expected flow conditions during the project life. This means that aggradation and degradation are to be confined to tolerable limits. Bank erosion is therefore not expected to appreciably change channel cross sections, and excessive sediment bars are not expected. Bridges and culverts are to be protected from excessive erosion. Surface water entry into the channels is to be controlled so that gullies do not form. Channel side slopes are to be vegetated except where riprap lining is used for stability; channel bottoms are to be riprap-lined for stability where necessary. Areas where riprap lining is to be used are shown in the channel profiles (Appendix E).

The modified channel will be constructed in a manner that will concentrate low flows rather than have the flows spread too thin for aquatic life. The typical cross section (Figure 2) illustrates this feature.

Normal procedure during stream channel construction is to first remove material from the stream bottom and then remove soil from streambanks to shape them to the designed slope. When the spoil is piled, the stream bed spoil is covered by streambank spoil. This minimizes erosion of the stream bed spoil before the establishment of vegetation. Nearby areas with the most impervious underlying materials will be selected for disposal of undesirable excavated materials. Disposal areas will be graded to minimize percolation of surface water through polluted material and minimize introduction of undesirable leachate into watercourses.

Table G

Road and Bridge Modifications in Areas of Channel Work

Channel Segment	Station	Type of Modification
North Fork of Adena	565+15	C.R.#13 bridge abutment protection.
	621+40	Twp. bridge pier protection.
Short Creek in Adena	706+80	Adena-Smithfield Rd. bridge pier protection.
Piney Fork in Dillonvale	776+50	Private bridge removal.
	781+50	*Replacement of four private bridges with bridge and alleyway.
	781+50	Private bridge removal.
	782+55	Private bridge removal.
	784+05	Private bridge removal.
	799+45	S.R. 152 bridge pier protection.
	808+55	Bridge removal.
	832+00	N&W Rwy. bridge pier protection.

*Costs borne by other than Public Law 566 funds.

Table G cont'd

Road and Bridge Modifications in Areas of Channel Work

Channel Segment	Station	Type of Modification
Short Creek in Newtown, Olszeski Town and Dillon-vale	1073+60	N&W Rwy. bridge pier protection.
	1084+70	Abandoned Twp. bridge removal.
	1110+60	Haul Rd. bridge removal.
	1113+60 to 1121+60	*C.R. #17 relocation to left of channel.
	1127+80	C.R.#7 bridge abutment protection.
	1139+90	N&W Rwy. bridge abutment protection.
	1165+90	S.R.#150 bridge abutment protection.
	1231+45	Second Street bridge protection by paving.
	1327+75	Twp. bridge abutment protection.

*Costs borne by other than Public Law 566 Funds.

Spoil material will be piled rather than spread in wooded and brushy areas or other areas where this disposition method will lessen disturbance of the streamside environment. In several reaches proposed for channel work, the streambanks are bordered by residential lawns. This will necessitate removal of the excavated material to other areas. Channel work will be carried out in a manner that will cause minimum damage to those lawns, including the preservation of as many trees as possible. Tree and brush clearing will be limited to the minimum necessary for construction and maintenance. Equipment will excavate from one bank only, where possible, to reduce the area that must be cleared for equipment operation. Where practical, spoil will be placed in nonwooded areas.

Clearing near the stream will be limited to the minimum amount necessary for construction and maintenance. Clearing upstream or downstream will be limited so that it will not exceed one reach (about one mile) in advance of channel construction to reduce erosion and sediment production.

Den trees and trees 10 inches in diameter and larger will be favored for preservation. Some of these trees will be left on the ends and edges of maintenance berms if they will not interfere with maintenance work.

Berms, diversions, and terraces will be constructed on or above cut slopes to provide stable banks and to prevent excessive erosion and subsequent sedimentation. Where conditions warrant, debris or sediment basins will be constructed to minimize sediment reaching the streams. Equipment parking areas, haul roads, and other construction areas will also be managed to minimize erosion and sedimentation.

During project installation, all state and local health, air, and water quality regulations will be adhered to.

Seeding of all reshaped banks, spoil areas, permanent rights-of-way, and all other disturbed areas will be completed as soon as possible. All disturbed areas, except channel slopes, will be seeded to temporary or permanent vegetative cover (as the construction schedules at these areas allow) at the end of each day's

work. Channel slopes will be seeded to permanent vegetative cover by the end of each day's work. All berm and spoil areas will be seeded with a wildlife habitat meadow mixture. The mixture and seeding rates per acre will be bromegrass - 5 lbs., alfalfa - 4 lbs., red clover - 3 lbs., timothy - 2 lbs., and orchard grass - 2 lbs. Sweet clover may also be added. The mixture will provide nesting cover and food for game birds, songbirds, and cottontail rabbits.

Tall fescue grass will be planted on all modified streambanks from the waterline to the edge of the maintenance berm and on modified areas (except permanent maintenance berms) where little, if any, wildlife cover is being disturbed by channel construction. The permanent maintenance berms will be seeded with the wildlife habitat meadow mixture.

A total of 46.8 acres of woods or brush will be disturbed by the channel work. This vegetation will be replaced by approximately 29.0 acres of trees, 11.2 acres of shrubs, and 6.6 acres of grasses and legumes. This will involve planting of about 51,600 feet of border along the modified stream segments.

The 40.2 acres of trees and shrubs will be planted mostly on the spoil mounds adjacent to the maintenance berms along the modified channels; however, some odd areas near the channels will be similarly planted. The types of trees and shrubs (especially suited to provide wildlife food and shelter of high quality) listed in Table H will be used, depending on availability. These plants will also be chosen for their suitability for the soils of the planting sites and by considering adjacent landowners' preferences.

Trees will be planted at the rate of 300 plants per acre, and shrubs will be planted at the rate of about 1,200 per acre. Shrubs will be planted in rows on both sides of the trees. In order to develop a more natural condition, the trees will be planted in a scattered pattern rather than in rows. Clump plantings of mixed species of trees of similar sizes and growth habits will be utilized at every opportunity.

Table H

Plants Suitable for Wildlife Habitat in Channel Work Areas

Common Name	Scientific Name
Eastern White Pine	*Pinus strobus*
Eastern Red Cedar	*Juniperus virginiana*
Scotch Pine	*Pinus sylvestris*
Silky Dogwood	*Cornus amomum*
American Hazel	*Corylus americana*
Autumn Olive	*Elaeagnus umbellata*
Tatarian Honeysuckle	*Lonicera tatarica*
Common Elderberry	*Sambucus canadensis*
Northern Red Oak	*Quercus rubra*
Sargent Crabapple	*Malus sargenti*
Snowberry	*Symphoricarpos albus*
Coralberry	*Symphoricarpos orbiculatus*
Highbush Cranberry	*Viburnum trilobum*
Staghorn Sumac	*Rhus typhina*
Smooth Sumac	*Rhus glabra*
Austrian Pine	*Pinus nigra*
Norway Spruce	*Picea abies*
Red Maple	*Acer rubrum*
White Oak	*Quercus alba*
Bur Oak	*Quercus macrocarpa*
Pin Oak	*Quercus palustris*
Red Mulberry	*Morus rubra*
White Mulberry	*Morus alba*
Nannyberry	*Viburnum lentago*
Black Cherry	*Prunus serotina*
Gray Dogwood	*Cornus racemosa*

The vegetated areas will be permanently marked with posts or other suitable identification. In pasture areas, fences will be constructed where necessary.

3. <u>Operation and Maintenance</u>

Landowners and operators will operate and maintain conservation land treatment measures on their lands. Technical assistance will be available for operation and maintenance from the Harrison and Jefferson Soil and Water Conservation Districts, the U.S. Forest Service, and the Ohio Department of Natural Resources, Divisions of Reclamation and of Forests and Preserves. Emergency repairs following severe storm events may become available on a case-by-case basis from the Agricultural Stabilization and Conservation Service.

The Short Creek Watershed Conservancy District will be responsibile for operating and maintaining structural project measures. Funds for the work will be obtained by the Conservancy District through the procedures of the Conservancy District Law of Ohio. The work will be accomplished using the District's staff, equipment, and materials or by contracts.

The Soil Conservation Service and the Short Creek Watershed Conservancy District will complete an operation and maintenance agreement for each structure before signing a land rights, relocation, or project construction agreement. The operation and maintenance agreements will set forth plans for operation and maintenance, and provide for establishment periods, inspections, and reports. They will include specific provisions for retention and disposal of real and personal property acquired or improved with PL 566 funds. The agreements will be in accordance with the State of Ohio Operations and Maintenance Handbook published by the Soil Conservation Service and will document the responsibilities of the Conservancy District and the Soil Conservation Service.

A period of three years or less after construction will be allowed to establish the vegetative cover associated with each structural measure. During this time, cost sharing for any work needed to obtain satisfactory

vegetative cover will be allowed at the same rate as that for installing the original works. After the establishment period, reestablishing vegetative cover will be a maintenance responsibility of the Conservancy District.

The planned structural measures are designed to function without routine operational activities. The Fox Bottom Reservoir will have a means of draining water from the sediment pool, which will remain dry until the Conservancy District and the Ohio Environmental Protection Agency determine that the water quality is suitable for impoundment. Any incidental public recreation use that may be allowed in the reservoir area is contingent upon improvement of water quality and the Conservancy District's providing adequate sanitary facilities in accordance with state law and upon its developing, promulgating, and enforcing use regulations. The District will take actions necessary to prevent public access and use of the reservoir if water quality does not improve and sanitary facilities are not provided.

Maintenance work will be done to keep the structural measures in good condition for proper functioning during the project life. The Fox Bottom Reservoir and channel work have design lives equal to that used in economic evaluation of the project (100 years).

The Conservancy District will protect the permanent vegetation from farming activities or urban encroachment by prompt, timely enforcement of land rights instruments.

Where vegetation is damaged by maintenance work or natural forces, it will be restored to comparable quality and quantity by the Project Sponsors. Wildlife habitat quality will be maintained on areas planted as part of the project measures by replanting or by management of natural plant successions.

Vegetative growth established for erosion control in the reservoir and stream construction areas will be maintained in a vigorous condition by fertilizing, reseeding, and other means as necessary. Unwanted vegetation will be controlled by mowing or other means.

Mowing will be delayed until after July 1 to minimize disturbances to nesting and young wildlife. During the establishment period, earlier mowing will be used, if needed, to control competition from annual plants.

Erosion damage will be repaired promptly and rodents controlled where necessary. Debris and sediment accumulations will be removed where they restrict flows near spillways and in channel work areas. Concrete and metal work will be maintained in good functional order by painting, repairing, or replacing as necessary.

Public and private bridges, other road facilities, and public utilities which have been modified to accommodate the project will be maintained by their owners with expenditures from their normal maintenance funds.

To assure an effective maintenance program at minimum cost, inspections of the Fox Bottom Reservoir and channel work areas will be made annually, after unusually severe storms, and whenever other unusual conditions may adversely affect the structural measures. During the first three years for each measure, the Soil Conservation Service and the Conservancy District will jointly conduct the inspections; thereafter, the Soil Conservation Service will determine if its participation is necessary. Authorized persons will have free access for inspections at any reasonable time. The Sponsoring Local Organizations will continue the inspections of each structural measure after the third year of its completion.

The inspections will determine if conditions of the structural measures are favorable for their proper functioning. Inspections reports will describe needed maintenance work and will include cost estimates for the work.

Typical inspection items for a reservoir include the following: drainage systems, relief wells and outlets; evidence of slope instability such as slides, slumps, or cracking; condition of vegetation; evidence of rodent or erosion damage; and the condition or riprap, concrete, and metal work.

Typical inspection items for channel areas include the following: the condition of and around drain pipe outlets, concrete water inlets and retaining walls, and riprapped channel linings; evidence of excessive erosion, deposition, or rodent damage; condition of vegetation and maintenance travelways; and the quality of wildlife habitat areas that were established to counteract habitat losses from the project's construction.

The Conservancy District will maintain records of inspections on continuing and completed maintenance work; it will furnish reports of these activities to the Soil Conservation Service and the Division of Water of the Ohio Department of Natural Resources. Periodic reports will continue until all deficiencies described in inspection reports are satisfactorily corrected.

For complex or unusually difficult or extensive maintenance work, the Soil Conservation Service may provide technical assistance such as drawings, specifications and layout if the Conservancy District requests the assistance.

The Conservancy District will prohibit installation of facilities or appurtenances that would interfere with the operation and maintenance of the structural measures. The District will obtain the Soil Conservation Service's approval of any drawings and specifications for altering or repairing a structural measure.

4. Project Costs

Details of estimated project installation costs are shown in Table I.

Costs for conservation land treatment are estimated from current costs of materials, equipment, labor, and supervision needed for each measure. Technical assistance costs are estimated from Soil Conservation Service expenditures in applying conservation measures to similar land.

Construction costs are engineers' estimates for labor, supervision, equipment and materials, with contingency allowances. Unit costs (derived during the Plan development in 1971) are based on recent contract bid schedules

Table I
ESTIMATED PROJECT INSTALLATION COST

Short Creek Watershed, Ohio

Sheet 1 of 2

Installation Cost Item	Acres To Be Treated2/	Estimated Cost (Dollars)1/ PL-566	Other	Total
CONSERVATION LAND TREATMENT				
Soil Conservation Service				
Cropland	7,650	-	21,400	21,400
Grassland	9,625	-	546,300	546,300
Miscellaneous Land	7,325	-	1,666,200	1,666,200
Technical Assistance	-	133,300	61,100	194,400
SCS Subtotal	24,600	133,300	2,295,000	2,428,300
Forest Service				
Forest Land	560	-	21,900	21,900
Technical Assistance	-	-	5,200	5,200
FS Subtotal	560	-	27,100	27,100
TOTAL CONSERVATION LAND TREATMENT	25,160	133,300	2,322,100	2,455,400

1/ Price Base 1975

2/ Non-Federal Land

Table I
ESTIMATED PROJECT INSTALLATION COST
Short Creek Watershed, Ohio

Sheet 2 of 2

Installation Cost Item	Number and Unit	Estimated cost (Dollars) 1/ PL-566	Other	Total
STRUCTURAL MEASURES				
Construction				
Soil Conservation Service				
Floodwater Retarding Structures	1	794,400	-	794,400
Stream Channel Work	10.0 mi.	2,675,400	-	2,675,400
SUBTOTAL-Construction		3,469,800	-	3,469,800
Engineering Services				
Soil Conservation Service		211,800	-	211,800
SUBTOTAL-Engineering		211,800		211,800
Relocation Payments				
Above Floodwater Retarding Structure		50,610	32,900	83,510
SUBTOTAL-Relocation Payments		50,610	32,900	83,510
Project Administration				
Soil Conservation Service				
Construction Inspection		450,000	-	450,000
Other		149,000	86,100	235,100
Relocation Assistance Advisory Services		-	1,410	1,410
SUBTOTAL-Project Administration		599,000	87,510	686,510
Other Costs				
Land Rights		-	454,300	454,300
SUBTOTAL-Other		-	454,300	454,300
TOTAL STRUCTURAL MEASURES		4,331,210	574,710	4,905,920
TOTAL PROJECT		4,464,510	2,896,810	7,361,320
Summary				
Subtotal SCS		4,464,510	2,869,710	7,334,220
Subtotal FS		-	27,100	27,100
TOTAL PROJECT		4,464,510	2,896,810	7,361,320

1/ Price Base 1975

March 1976

and completed construction contract costs of similar projects in Ohio, adjusted to the 1975 price level. Contingency allowances range from 12 to 20 percent of the construction costs and reflect the intensity of site investigations, degree of design detail, and possibilities of encountering latent conditions during construction.

Engineering costs are for design surveys, geologic borings, soil mechanics tests and reports, designs, preparation of drawings and specifications and similar services.

Relocation payment costs for persons and farm operations displaced by the Fox Bottom Reservoir include moving expenses for persons and farm operations, financial assistance with replacement housing for eligible individuals, and related expenses associated with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (PL 91-646).

Project administration costs of installing structural measures are for contract administration, review of engineering plans, government representatives for contracts, administration of relocation payments, inspection to assure construction in accordance with drawings and specifications, and overhead. Overhead includes costs of direct and indirect services of the Soil Conservation Service and the Project Sponsors in installing the project structural measures.

Land rights costs are for the acquisition of land (including improvements and utilities) needed for installing structural measures. Land costs include those of fee simple titles to land and improvements, easements, rights-of-way, and mineral rights. Land rights costs that apply to utilities include alteration or removal of electric, gas and sewer lines, and other facilities. Reservoir land costs are based on fee simple acquisition of areas needed for the dam and spillways, sediment storage, floodwater detention, borrow and construction, and on costs of mineral rights needed to prevent surface subsidence in the reservoir area.

Costs of reconstructing, reinforcing, or protecting existing public road and railroad bridges are project

construction costs allocated to flood control and will be borne by PL 566 funds. Other road changes required for the project are land rights costs incurred by local Project Sponsors.

Project operation and maintenance costs, estimated to be $21,650 yearly, are to be borne by the Sponsoring Local Organizations. The total estimated annual costs of installation, operation and maintenance of project structural measures are $322,920. This is equivalent to a one-time cost of $5,258,000 if an interest rate of 6 1/8 percent is used with a 100-year project life.

The project benefit-cost ratio, obtained by dividing the total estimated project benefits from structural measures by the total estimated costs of structural measures, is 1.3 to 1.0.

E. ENVIRONMENTAL SETTING

1. Physical Resources

The project area in Short Creek Watershed comprises 81,280 acres (127 square miles) in eastern Ohio, 42,526 acres in Jefferson County and 38,754 acres in Harrison County. The watershed is midway between Zanesville, Ohio, and Pittsburgh, Pennsylvania. This watershed project applies to that portion of the watershed from the headwaters to the confluence with Little Short Creek.

The watershed includes an area of about 81,280 acres. Land use in the watershed is 15 percent cropland, 16 percent pastureland, 10 percent forest land, and 59 percent in other land. The other land consists of 30 percent revegetated surface-mined area, 20 percent idle, 6 percent miscellaneous, and 3 percent urban. The rather high percentage of other land is due primarily to the large acreage owned by coal interests.

Land use in the flood plain of Short Creek and its major tributaries is about 45 percent urban, 29 percent cropland, 3 percent pastureland, 7 percent forest land, and 16 percent other land.

Three major tributaries originate in eastern Harrison County and join at the Village of Adena to form the main stem of Short Creek, which continues eastward through Adena and Dillonvale in Jefferson County to its confluence with the Ohio River at Warrenton, Ohio.

The Short Creek Watershed is located in two water resource planning regions. It is in the east central portion of the Muskingum Region and the western portion of the Pittsburg-Wheeling-Beaver Subregion.

The drainage of Short Creek has formed a dendritic pattern which is partially controlled by the underlying bedrock. The main valley of Short Creek averages 0.25 mile wide, has a gradient of seven feet per mile, and is about 20 miles long. Banks are tree-lined in most areas, and small gravel bars occur in the stream bed.

The watershed has not been glaciated and lies in hilly topography of repetitive sequences of sandstone, limestone, shale, and coal.

About 10,000 people inhabit the watershed, with about 3,400 in Cadiz (the county seat of Harrison County) and 1,200 each in Adena and Dillonvale. Approximately half of the watershed's population lives in rural areas.

The villages of Adena and Dillonvale, along with the residential centers of Newtown and Hagan Addition, are located in the main valley, while Cadiz lies in the headwaters area. Small villages located in the watershed include Hopedale, Harrisville, Smithfield, Mount Pleasant, Georgetown, Piney Fork, Newell, and Connorville.

About 24,000 acres (approximately 30 percent) of the watershed have been periodically disturbed by surface mining (contour strip and area mining). Unreclaimed surface-mined lands experience high rates of erosion, increasing suspended sediment concentrations (which affect overall water quality), and increasing downstream sedimentation. Runoff from surface-mined lands in the Short Creek Watershed is generally not acid due to the presence of buffering limey rock in the spoil. However, acid mine drainage from deep mines decreases water quality as does inadequately treated effluent from municipal sewage treatment plants.

Within the drainage area of the proposed Fox Bottom floodwater retarding structure there are about 5600 acres of surface-mined land (based on recent aerial photographs). These are all "Class 2" surface-mined areas, as described by the Ohio Department of Natural Resources:1/

> "Class 2 strip mines have generally been satisfactorily reclaimed, minimizing the need for application of additional reclamation costs. A reclamation cost of $250 per acre was applied to lands in this class to permit limited spot treatment or reclamation where required."

1/ "Technical Report of the Board on Unreclaimed Strip Mined Lands - Base Data and Reclamation Cost Development for the Initiation of a Long Range Reclamation," Ohio Department of Natural Resources, December 31, 1973, pp. 98 and 99.

No new surface mining is known to be presently occurring within the drainage area of the proposed Fox Bottom reservoir. However, more than 24 miles of strip mine highwalls exist as visible evidence of the intensive mining of the past.

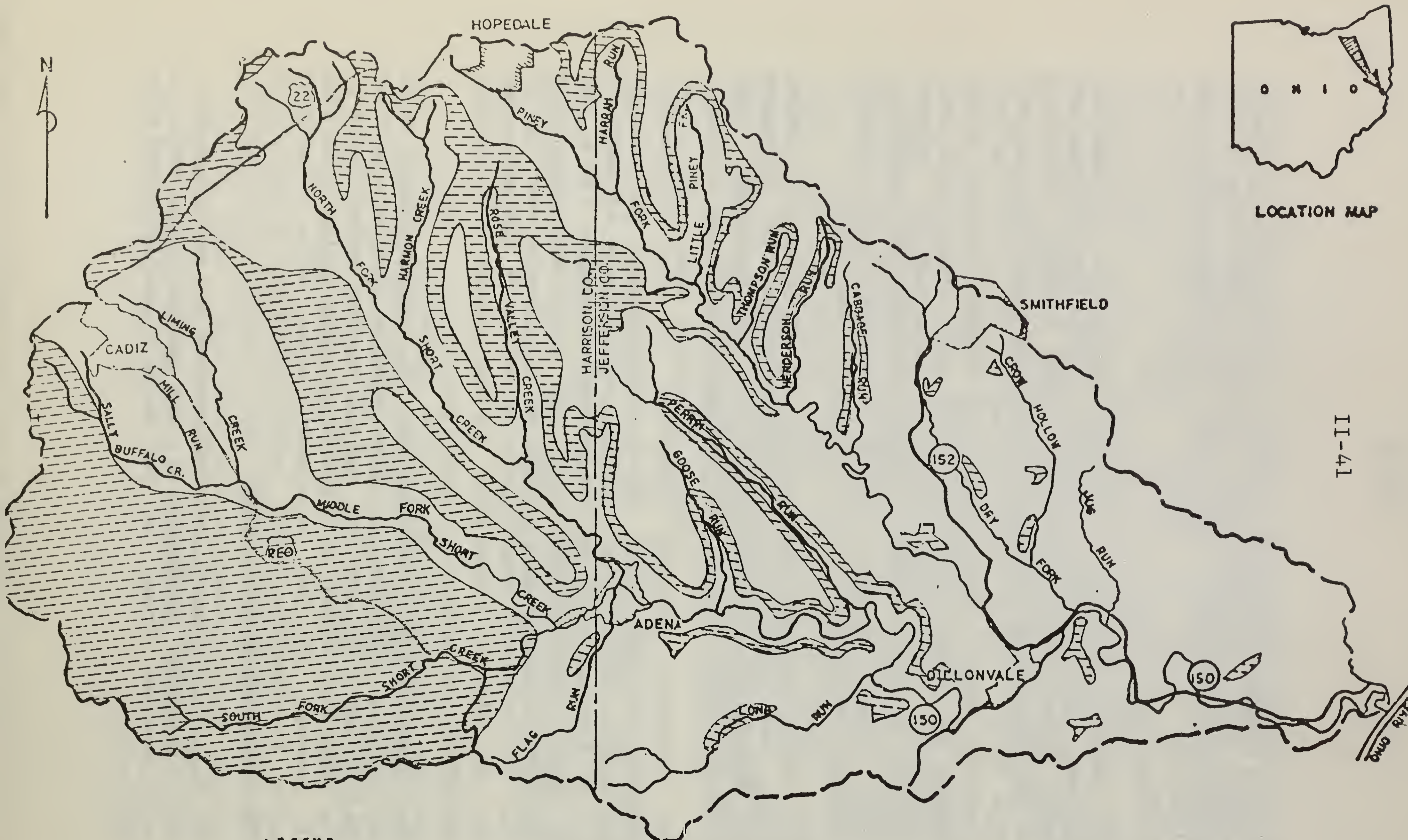
The watershed lies within the Unglaciated Appalachian Plateau physiographic province. Although the area was never covered by glaciers, their effects are found in the watershed. Streams that flowed within the present Ohio River Valley were blocked by the glacial masses, creating lakes. One finger of a lake extended up the valley of Short Creek in which sands and gravels were deposited. These sands and gravels buried the original stream channel of Short Creek from Adena to Warrenton. Short Creek is now cutting its way slowly downward through the gravels to the original valley floor.

The underlying bedrock is composed of sandstone, shale, coal, and limestone of the Pennsylvanian-aged Conemaugh and Monongahela Formations and to a lesser extent the Permian Dunkard Group, the youngest rock found in Ohio.

The regional geologic structure of the sedimentary bedrock in the Short Creek Watershed is essentially horizontal, displaying a slight regional dip of about 30 to 40 feet per mile in the general direction S30°E. Due to this regional structure, coal is surface-mined from the Pennsylvanian-aged formations at lower elevations in the southern and southeastern portions of the watershed and at higher elevations in the western and northern portions.

The geographical distribution of surface-mined areas is also a function of the regional geologic bedrock orientation: 28 percent of all surface-mined lands in the watershed occur in Jefferson County, which comprises 48 percent of the watershed's area, while 72 percent occur in Harrison County, which comprises 52 percent of the watershed's total area.

The following generalized information (by drainage area) describes the geographical and spatial occurrences of surface-mined areas in the Short Creek Watershed (See Figure 3).



LEGEND

- Roads
- Small Villages
- Streams
- Watershed Boundary
- County Line

Figure 3
GENERALIZED SURFACE-MINED AREAS
SHORT CREEK WATERSHED

5000 0 2500 5000 10000
SCALE IN FEET

PINEY FORK: Strip mines occur above the 900 ft. Mean Sea Level (M.S.L.) elevation above Dillonvale, ranging to above 1200 ft. M.S.L. in upper reaches. Area mining is scattered, especially through divides of Rose Valley Creek and Harmon Creek.

PERRIN RUN: Strip mines occur from above 900 ft. M.S.L. near the confluence of Perrin Run with Short Creek, to above 1000 ft. M.S.L. in the upper reaches. Stripping and overspill are found occasionally near stream level in the upper reaches.

ROSE VALLEY CREEK: Strip mines occur above 1100 ft. M.S.L. with area mining through the northern divides. Stripping and overspill are found occasionally near stream level in the upper reaches.

SOUTH FORK: Extensive area mining occurs with contour stripping above 1100 ft. M.S.L. Northern tributaries are area-mined through divides to the Middle Fork (Fox Bottom) drainage area.

MIDDLE FORK: Area mining occurs with contour stripping above 1100 ft. M.S.L.

NORTH FORK: Strip mines occur above 1100 ft. M.S.L. but are sporadic in the upper reaches.

SHORT CREEK: (Below confluence of Piney Fork with Short Creek) Strip mines are few in number and relatively small in area above 800 ft. M.S.L. Older, revegetated, nongraded stripped areas exist in this area.

Topographically, the watershed displays rugged relief, with a maximum elevation difference of 680 feet. The hills rise sharply to rounded tops on both sides of the stream valley. Steep gradients are found on the tributaries to Short Creek.

Major soils in the watershed are Muskingum and Westmoreland. These have developed from sandstone, shale, and some limestone on hilly relief. Other soils within the watershed are Newark, Huntington, and Linside. They occur on nearly level areas of first bottoms and have formed in alluvium from upland soils which developed in

bottoms underlain by limestone. Soils on reclaimed surface-mined land are fine textured, nonacid, and non to slightly stony. (Soil series names are not given for these soil types.)

The watershed's climate is known as moist temperate. The mean annual temperature is 51° F; the mean maximum temperature is 76° F, occurring in July. The average annual precipitation is 39 inches. The normal growing season is 133 days, between May 17 and September 28. Prevailing winds are from the west.

The watershed, in general, has poor potential for development of significant groundwater supplies. Upland wells yield less than 5 gallons per minute and are adequate only for domestic use. Wells drilled into alluvial sand and gravel in the flood plain of Short Creek, however, produce higher yields and are the best sources of groundwater for municipal and industrial supplies in the watershed.

Mineral products of economic value are limestone and coal. The most important coal beds are the Pittsburgh No. 8 and Redstone No. 8A in the Monongehela Formation, which have been surface-mined, and the lower Freeport No. 6A of the Allegheny Formation which has been deep mined. Other important coal beds are the Middle Kittanning No. 6 and Upper Freeport No. 7 coals, also of the Allegheny Formation. Only below the western portion of the watershed are these two beds of mineable thickness. The Allegheny Formation (below the Conemaugh) does not appear at the surface within the watershed but is exposed to the west. Some areas that have been surface-mined in the past have since been graded and reclaimed, and numerous lakes occur below the high walls of mined areas. Some areas which were originally surface-mined for the Redstone No. 8A coal are now being remined for the Pittsburgh No. 8 coal. Limestone has been quarried near Cadiz where the Fishpot Limestone member of the Monongahela Formation occurs.

The North, Middle and South Forks of Short Creek originate in southeastern Harrison County and join at the Village of Adena in southwestern Jefferson County to form the main stem of Short Creek. Short Creek continues

easterly across Jefferson County through the Village of Dillonvale and flows into the Ohio River at Warrenton, Ohio. The project area includes that portion of the Short Creek Watershed from the headwaters to the confluence of Little Short Creek with Short Creek, about one mile west of Warrenton.

There are approximately 233 miles of streams in the project area, as shown on United States Geological Survey topographic maps. The three forks and main stem of Short Creek comprise about 47 miles, and the twenty other waterways in the area considered to be major creeks total 72.7 miles. The remaining 113 miles of streams represent the numerous small tributaries throughout the project area.

Information concerning the major streams, their general locations and configurations are shown in Table J and Figure 4.

There are 203 ponds and lakes in the watershed with a total surface area of 629 acres (See Table K). Many of these aquatic areas were created by stripmining operations and most are believed to contain fish populations. Acid mine runoff into these ponds is buffered by the lime in the soils and rocks. 1/ Water quality tests made at three of these stripmine ponds on October 17 and 18, 1973, showed that although the carbon dioxide readings were above the desirable level, the pH and dissolved oxygen levels were favorable for aquatic life. (These data are listed in Table R). The stripmine ponds and farm ponds make a significant contribution to sport fishing in the Short Creek Watershed.

Table K
Size Distribution of Lakes and Ponds in the Project Area

	Surface Area of Ponds (Acres)					
	0.1-0.99	1-2.00	3-4.00	5-9.99	10+	Total
Number	67	82	30	14	10	203
Surface Acres	33.56	160.04	111.04	87.95	235.81	629.01

1/ Letter from R.W. Burwell, Regional Director, U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Minneapolis, Minnesota, to Raymond Brown, Columbus, Ohio, January 31, 1967.

Table J

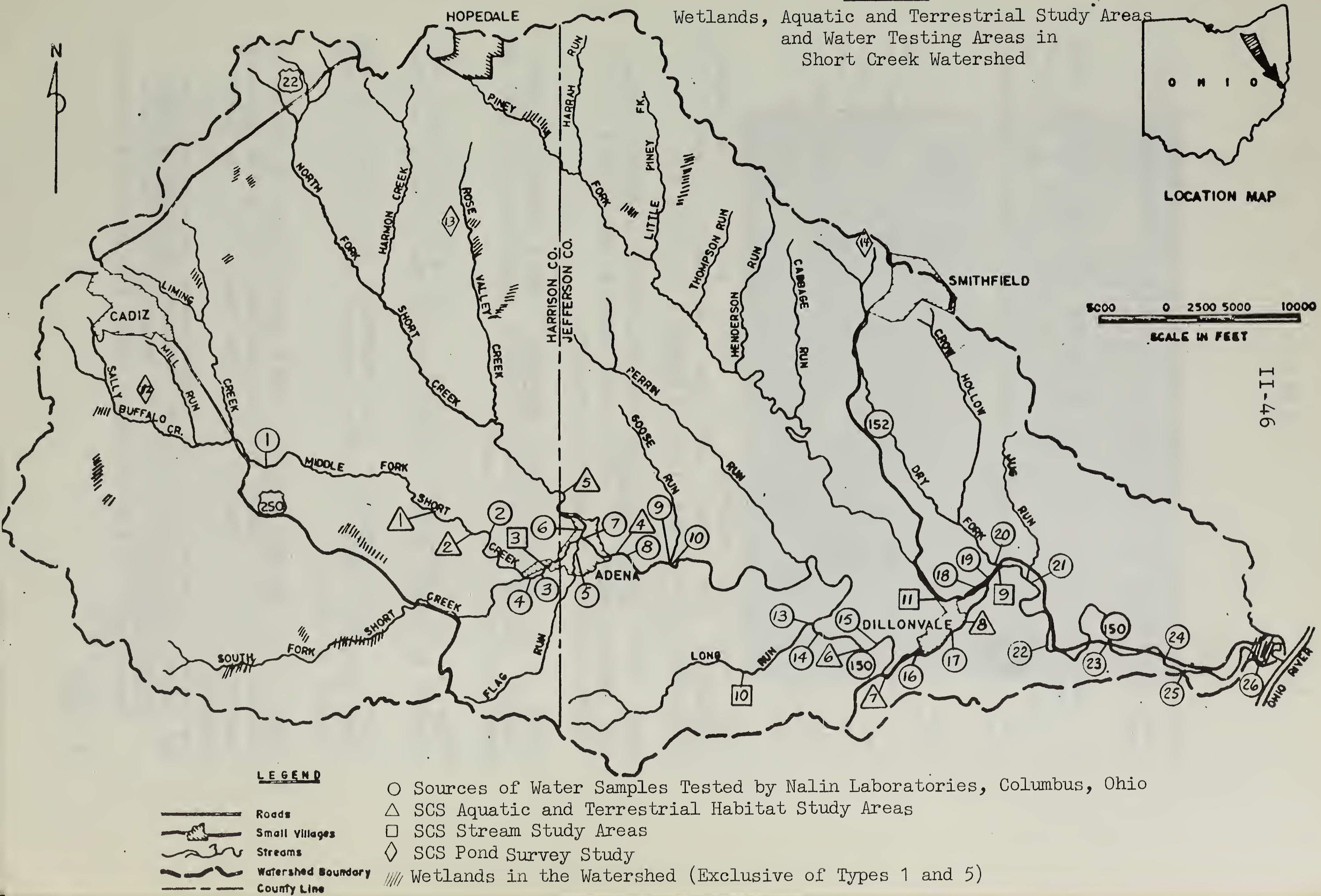
Information About the Major Streams in the Project Area a/

Stream	Length (Miles)	Average Fall (Ft/Mi)	Flows Into	Drainage Area Sq. Mi.	Flow Condition
Short Creek (Main Stem)	20.1	12.2	Ohio River	123.14	Perennial
Jug Run	2.2	204.5	Short Creek	1.98	Intermittent
Dry Fork	6.1	86.4	Short Creek	8.52	Perennial
Crow Hollow Creek	3.9	-	Dry Fork	-	Intermittent
Piney Fork	13.4	38.2	Short Creek	22.56	Perennial
Cabbage Run	2.8	117.5	Piney Fork	1.76	Intermittent
Henderson Run	2.6	92.3	Piney Fork	1.62	Intermittent
Thompson Run	2.5	107.2	Piney Fork	1.44	Intermittent
Little Piney Fork	3.9	66.7	Piney Fork	3.06	Intermittent
Harrah Run	2.4	87.5	Piney Fork	1.56	Intermittent
Long Run	4.0	96.4	Short Creek	6.58	Perennial
Perrin Run	6.1	74.6	Short Creek	5.22	Perennial
Goose Run	2.6	119.7	Short Creek	1.46	Intermittent
North Fork Short Creek	9.8	41.3	Short Creek	22.48	Perennial
Coal Run	1.1	269.4	North Fork Short Creek	0.38	Intermittent
Rose Valley Creek	4.2	67.8	North Fork Short Creek	4.12	Intermittent
Harmon Creek	3.5	69.2	North Fork Short Creek	2.98	Intermittent
Flag Run	3.4	53.0	Short Creek	2.42	Intermittent
Middle Fork Short Creek	9.3	31.9	Short Creek	24.06	Perennial
Liming Creek	3.1	-	Middle Fork Short Creek	-	Intermittent
Mill Run	1.9	-	Middle Fork Short Creek	-	Intermittent
Sally Buffalo Creek	3.0	-	Middle Fork Short Creek	-	Intermittent
South Fork Short Creek	7.9	43.9	Short Creek	14.48	Perennial
TOTAL	119.8				

a/ Gazetteer of Ohio Streams, Ohio Department of Natural Resources, Division of Water, Report No. 12 Ohio Water Plan Inventory, 1960, p. 75. (Lengths of Crow Hollow, Liming, S. Buffalo Creek and Mill Run were measured on USGS topographic maps.)

Figure 4

Wetlands, Aquatic and Terrestrial Study Areas and Water Testing Areas in Short Creek Watershed



○ Sources of Water Samples Tested by Nalin Laboratories, Columbus, Ohio

△ SCS Aquatic and Terrestrial Habitat Study Areas

□ SCS Stream Study Areas

◇ SCS Pond Survey Study

//// Wetlands in the Watershed (Exclusive of Types 1 and 5)

Wetlands in this watershed have been classified according to the types defined by the U.S. Department of the Interior, Fish and Wildlife Service. 1/

A total of 767.4 acres of wetlands have been identified in the Short Creek Watershed, excluding Type 5 wetlands which are defined by the Fish and Wildlife Service as open fresh water areas (ponds, lakes, streams, sloughs, etc.).

Type 1 wetlands are seasonally flooded basins and flats. These wetlands are usually very temporary, depending on the duration of flooding. Type 1 wetland vegetation includes cultivated crops, weeds and bottom land trees and shrubs. The estimated 661 acres of Type 1 wetland identified in this watershed are distributed mainly throughout the flood plains of Short Creek and its forks.

The remaining estimate of 106.4 acres of wetlands, excluding the Type 1 and Type 5 wetlands, comprise the following five types (See Figures 5 through 7):

Type 2 - Fresh Meadows - Soil without standing water, but waterlogged to within at least a few inches of its surface during the growing season.

Type 3 - Shallow Fresh Marshes - Soil normally waterlogged during the growing season; often covered with as much as six inches of water.

Type 4 - Deep Fresh Marshes - Soil covered with six inches to three feet of water during the growing season.

Type 6 - Shrub Swamps - Soil normally waterlogged during the growing season; often covered with as much as six inches of water.

Type 7 - Wooded Swamps - Soil waterlogged at least to within a few inches of its surface during the growing season; often covered with as much as one foot of water. 2/

1/ Samuel Shaw and C. Gordan Fredine, Wetlands of the United States, Circular 39, Washington, D.C., U.S. Department of the Interior, Fish and Wildlife Service, pp. 20-22.

2/ Ibid.

Figure 5
Types 3, 4, and 5 Wetlands near the Georgetown Coal Preparation Plant, Cadiz Township, Harrison County

Figures 6 and 7
Types 3, 4, and 5 Wetlands at Rayland, Ohio

An estimated 30 acres of the remaining 106.4 acres of wetlands classified as Types 2, 3, 4, 6, and 7 are subject to periodic flooding due to their locations in the watershed's flood plain. Since Type 1 wetlands were identified by flood frequency analyses, their classification overlaps other flood plain wetlands and results in double counting of the aforementioned 30 acres.

Wetland Types 2, 3, 4, 6, and 7 in the watershed are described in Table L. It should be noted that the 26.8 acres of wetlands listed in the table for Rayland in Jefferson County are not in the project area (area benefited), but are in the Short Creek Watershed and will be affected by the project.

2. Present and Projected Population

About 10,000 people inhabit the watershed, with about 3,400 in Cadiz and 1,200 each in Adena and Dillonvale. Approximately 42 percent of the population lives in rural areas. Over the past 10 years there has been a slight decrease in population in the area. The population is considered stable, and current projections indicate some future growth.

3. Economic Resources

Agriculture and coal mining are the major economic enterprises in the watershed. However, a significant proportion of the people are employed by manufacturing industries and retail marketing establishments in Steubenville, Ohio, and Wheeling, West Virginia. Economic conditions in these urban centers have a greater effect on employment levels in the watershed than do the local economic conditions.

All land in the watershed is privately owned, with 46 percent in farms. About 83 percent of the farms are owner-operated as indicated by the 1969 agricultural census. There are about 227 farms in the watershed, averaging 167 acres in area. Agricultural lands and buildings have an estimated average value of $140 per acre. Livestock and livestock products account for about 80 percent of all farm produce sold. Grain, fruits and vegetables, and forest products supply additional income.1/

1/ U.S. Department of Commerce, Bureau of Census, 1969 Census of Agriculture (Washington, D.C., September 1971).

Table L

Wetlands Identified in the Short Creek Watershed
(Exclusive of Types 1 and 5)

Relative abundances of wetland types at each location are denoted by the letters: P (predominant); A (abundant); and S (scarce).

Location	Estimated Total Acres	Wetland Types				
		2	3	4	6	7
Harrison County						
1. Sec. 2 & 3, Cadiz Twp., adj. to St. Rt. 9	8.1		S	P		
2. N. part of Sec. 3, Cadiz Twp., adj. to St. Rt. 9	3.3		P		S	
3. Sec. 30, Short Cr. Twp., adj. to Co. Rt. 41	5.8	S	A	A		
4. 0.25 mi. E. of above wetland	1.6		A	S		
5. Sec. 24 & 30, Short Cr. Twp., adj. to Co. Rt. 41	11.4		A	A	S	S
6. Sec. 13, 19 & 20, Short Cr. Twp., adj. to U.S. Rt. 250	10.6	S	P			S
7. Sec. 35, Cadiz Twp., 0.5 mi. E. of Cadiz	1.6	S	P			
8. 0.3 mi. E. of above wetland	0.8		A	A		S
9. Sec. 25, Green Twp., adj. to St. Rt. 9	1.5	S	P			
10. 700 Ft. S.E. of above wetland	1.6	S	P			
11. Sec. 12, Green Twp., adj. to Rose Valley Rd.	6.5	S	P			
12. Sec. 1 & 2, Green Twp., adj. to St. Rt. 151	13.0	S	P			
13. Sec. 5 & 11, Green Twp., 0.8 mi. W. of Jef. Co.	8.0	S	P			
Jefferson County						
14. N. part of Sec. 30, Smithfield Twp.	1.8		A			
15. E. part of Sec. 25, Smithfield Twp.	4.0	S	P			
16. Rayland (Warren Twp.), 0.3-0.5 mi. W. of Ohio R.	26.8		A	P	S	S
TOTAL	106.4					

About one-third of the land in the watershed is owned by coal companies. In Jefferson and Harrison Counties during 1970, there were 8,217 taxable incomes from mining, 5,096 from retail enterprises and 23,754 from manufacturing, illustrating the impact of Steubenville and Wheeling industry on the economy. Fifty-eight percent of the farmers worked 100 or more days off the farm. Off-the-farm annual incomes averaged $4,816 per household where at least one person worked away.1/

Both Harrison and Jefferson Counties are in the Appalachian Region as designated under the Appalachian Regional Development Act of 1965.

4. Plant and Animal Resources

A variety of woody and herbaceous habitat for wildlife exists in this watershed. The largest tracts of forest land are in the eastern half of the watershed, especially east and southeast of Adena and Smithfield. The watershed's forest land is least abundant in the southwestern section of the watershed where stripmining has been especially active.

These forest lands are primarily hardwoods with scattered softwood plantations in some areas. The major hardwoods include oaks, hickories, elm, ash, red maple, sugar maple, black locust, yellow poplar, and beech. Softwood plantings include Scotch, white and red pines and Norway spruce. 2/

Weeds and shrubs have developed on abandoned pastures and on odd areas adjacent to cropland, forest land, streams, and other areas throughout the watershed. Mature trees and shrubs as well as herbaceous vegetation are found on most of the stream banks in the watershed (See Figures 8 and 9).

The forest lands, old pastures, odd areas, and streamside strips of vegetation provide food and shelter for

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1/ Ibid.
2/ Letter from Frank J. Paradise, Assistant Director of Division of Flood Prevention and River Basin Programs for the U.S. Forest Service to Raymond S. Brown, State Conservationist, Soil Conservation Service, Columbus, Ohio, August 31, 1967.

Figures 8 and 9
Areas of Short Creek (Planned for Channel Work) and Adjacent Vegetation near the Sewage Treatment Plant at Dillonvale

white-tail deer, squirrels, rabbits, raccoons, opossums, ruffed grouse, bobwhite quail, a wide variety of nongame birds, mammals and reptiles. The interspersion of these habitats with other vegetative conditions adjacent to them form extensive amounts of "edges" which supply diversified habitats which tend to attract varieties of wildlife species.

The widely scattered wetlands in the watershed provide limited habitat for a variety of vertebrates including muskrats, mink, beaver, ducks, herons, turtles, water snakes, frogs and other mammals, birds, reptiles, and amphibians. Species such as marsh hawks, raccoons, and foxes are attracted to wetlands by the presence of prey species. Also, the various depths of water, substrates, plants, and other factors attract a multitude of aquatic invertebrate species which supply basic links to the wetland wildlife food chains.

Land uses in the 321-acre area proposed for the Fox Bottom Reservoir, including its floodwater detention pool consist of: 60 acres of cropland, 160 acres of pastureland, 78 acres of forest land, and 23 acres of other land. Sapling, pole-sized trees, and mature trees are found at the site along the Middle Fork of Short Creek, scattered in some of the numerous weed fields of the area, and on the steep hillsides adjacent to the reservoir site.

The wooded areas of the reservoir site contain an abundance of sycamores with willows, box elders, maples, and elms being common. Goldenrods and asters are also abundant in the area. Other plant species found at the reservoir site include: white oak, red oak, shagbark hickory, ground ivy, bracken fern, crown vetch, common ragweed, red clover, wild carrot, field peppergrass, flowering spurge, common mullen, and teasel.

Wildlife habitats at this reservoir site are found mainly at the brushy field borders, wooded hillsides, some of the older weed fields, and adjacent to the stream. Significant amounts of trees, shrubs, grasses, and/or weeds have been established in many of these areas. They provide food and shelter suitable for white-tail deer, cottontail rabbits, bobwhite quail, certain nongame birds, and other animals.

Wildlife observed at this area included redwing blackbirds and starlings (about 90 individuals), turkey vultures (10), opossum (2), bluejay (1), and woodchuck (1). Tracks were also seen of white-tail deer, raccoon, opossum, and muskrat.

Nearly all of the areas along Piney Fork and the North Fork of Short Creek (and many areas along Short Creek in Adena and Dillonvale) proposed for channel work are bordered by lawns, parking areas, buildings, and other human developments. In these areas, the small amounts of natural vegetation (5-15 feet wide in many areas) adjacent to the streams provide habitat suitability limited mainly to songbirds and other nongame birds.

The most significant areas of wildlife habitat in the proposed channel work areas are in the wooded areas on the western and eastern outskirts of Adena, southwest and northeast of Dillonvale, and an area on the south side of Short Creek at Dillonvale. Woody and herbaceous vegetation in these areas are enough to supply food and shelter for cottontail rabbits, raccoons, opossums, songbirds, and other wildlife.

Tables M-1 and M-2 list in detail the plants identified at the seven study areas (Areas 1 and 2 are located at the proposed Fox Botton Reservoir site) and summarize their relative abundances throughout the seven areas. Birds identified in the watershed are listed in Table N.

Observations were also made at an area adjacent to Piney Fork about 0.75 mile west of the confluence of Piney Fork and Short Creek just downstream from the proposed end point for channel work on Piney Fork. Natural vegetation at this area is limited to trees, shrubs, and brush in a 10 to 20 - foot width on each side of the stream, since lawns and parking areas are adjacent to the stream banks. Trees scattered through the area include: silver maple, elms, willows, black walnut, sweet gum, sycamore, and evergreens (at the edges of lawns).

Observations made along Short Creek in and near Dillonvale revealed that black willows, elms, and especially

Table M-1

The following plants were the most abundant species identified in certain study areas (each 270-500 feet in length) where channel work is proposed in the Short Creek Watershed:

Station 3 - (Adjacent to Short Creek on western outskirts of Adena between county line and baseball field)

Abundant		Common	
Willows	Ground Ivy	Sycamore	American Elm
Coneflowers	Daisy Fleabane	Goldenrod	Slippery Elm
		Jewelweed	Common Ragweed
		Greenbriers	Canada Wild Rye

Station 4 - (Along Short Creek at the eastern edge of Adena, 600 feet from the sewage treatment plant, from railroad bridge to about 0.25 mile downstream)

Abundant		Common	
Sycamore	Wild Grape	Ninebark	American Elm
Goldenrod	Slippery Elm	Box Elder	Orchard Grass
Black Willow		Dock	Pussy Willow
		Brambles	Foamflowers
		Ohio Buckeye	

Station 5 - (North Fork of Short Creek, 200 feet east of Jefferson-Harrison County line)

Abundant		Common	
Willows	Goldenrod	Yellow Coneflowers	Wild Grape
Asters	Wild Carrot	Evening Primrose	Silver Maple
		Canada Wild Rye	

Station 6 - (Along Short Creek, 0.5 mile east of Newtown at the Haut Road bridge)

Abundant	Common	
Sycamore	Cottonwood	Coneflowers
Willows	Ninebark	

Station 7 - (Along Short Creek, at Rt. 150 bridge between Newtown and Dillonvale)

Abundant	Common		
Orchard Grass	Elms	Wild Grape	Box Elder
Healall	Willows	Goldenrod	Sycamore
	Burdock	Spike Rush	Foamflowers
	Yarrow		

Table M-2

Total Species Composition and Relative Abundances of Plants Identified at Seven Study Areas Adjacent to Streams in the Short Creek Watershed (a)(b)

Abundant (In 1-3 Areas)

1. American Sycamore (Platanus occidentalis)
2. Box Elder (Acer negundo)
3. Willows (Salix spp.)
4. Daisy Fleabane (Erigeron strigosus)
5. Wild Carrot (Daucus carota)
6. Ground Ivy (Glechoma hederacea)
7. Asters (Aster spp.)
8. Goldenrods (Solidago spp.)
9. Coneflowers (Rudbeckia spp.)
10. Orchard Grass (Dactylis glomerata)
11. Heal-all (Prunella vulgaris)

Common (In 1-4 Areas)

1. Willows (Salix spp.)
2. Eastern Cottonwood (Populus deltoides)
3. American Elm (Ulmus americana)
4. Slippery Elm (Ulmus rubra)
5. American Sycamore (Platanus occidentalis)
6. Ninebark (Physocarpus opulifolius)
7. Box Elder (Acer negundo)
8. Silver Maple (Acer saccharinum)
9. Ohio Buckeye (Aesculus glabra)
10. Eastern Hemlock (Tsuga canadensis)
11. Jewelweed (Impatiens sp.)
12. Goldenrods (Solidago spp.)
13. Dock (Rumex sp.)
14. Greenbrier (Smilax sp.)
15. Wild Grape (Vitis sp.)
16. Foamflowers (Tiarella sp.)
17. Spike Rush (Eleocharus sp.)
18. Orchard Grass (Dactylis glomerata)
19. Common Ragweed (Ambrosia artemisiifolia)
20. Canada Wild Rye (Elymus canadensis)
21. Evening Primrose (Oenothera biennis)
22. Coneflowers (Rudbeckia sp.)
23. Burdock (Arctium minus)
24. Yarrow (Achillea millefolium)

Scattered or Scarce (In 1-4 Areas)

1. Quaking Aspen (Populus tremuloides
2. Bur Oak (Quercus macrocarpa)
3. American Basswood (Tilia americana)
4. Ninebark (Physocarpus opulifolius)
5. American Sycamore (Platanus occidentalis)
6. Red Maple (Acer rubrum)
7. Sugar Maple (Acer saccharum)
8. Black Maple (Acer nigrum)
9. Box Elder (Acer negundo)
10. Ohio Buckeye (Aesculus glabra)
11. Hackberry (Celtis occidentalis)
12. Eastern Hophornbeam (Ostrya virginiana)
13. American Elm (Ulmus americana)
14. Black Locust (Robinia pseudoacacia)

Table M-2(cont'd)

Scattered or Scarce cont'd

15. Black Walnut (Juglans nigra)
16. Black Cherry (Prunus serotina)
17. Wild Plum (Prunus americana)
18. Bitternut Hickory (Carya cordiformis)
19. Common Elderberry (Sambucus canadensis)
20. Rasberry (Rubus sp.)
21. Staghorn Sumac (Rhus typhina)
22. Hawthorns (Crataegus sp.)
23. Eastern Red Cedar (Juniperus virginiana)
24. Japanese Honeysuckle (Lonicera japonica)
25. Yarrow (Achillea millefolium)
26. Foxtail (Setaria sp.)
27. Burdock (Arctium minus)
28. Pokeweed (Phytolacca americana)
29. Teasel (Dipsacus sylvestris)
30. Chicory (Cichorium intybus)
31. Canada Thistle (Cirsium arvense)
32. Thistles (Cirsium spp.)
33. Stinging Nettle (Urtica procera)
34. Vervains (Verbena spp.)
35. Common Milkweed (Asclepias syriaca)
36. Goldenrods (Solidago spp.)
37. Cocklebur (Xanthium pennsylvanicum)
38. Curled Dock (Rumex crispis)
39. Spike Rush (Eleocharus sp.)
40. Coneflowers (Rudbeckia spp.)
41. Wild Carrot (Daucus carota)
42. Crown Vetch (Coronilla varia)
43. Red Clover (Trifolium pratense)
44. Foamflowers (Tiarella spp.)
45. Orchard Grass (Dactylis glomerata)
46. Giant Ragweed (Ambrosia trifida)
47. Canada Wild Rye (Elymus canadensis)
48. Violet Fleabane (Erigeron sp.)
49. Evening Primrose (Oenothera biennis)
50. Rugel's Plantain (Plantago rugelii)

(a) Certain plants are listed more than once because they exist in different densities at different locations.

(b) The following references were used for identification:

Trees of North American by C. Frank Brockman, Golden Press, New York, 1968.

Weeds of the North Central States, University of Illinois, Agricultural Experiment Station, Circular 718. Urbana, Illinois, 1960.

A Field Guide to Trees and Shrubs by George A. Petrides, Noughton Mifflin Company, Boston, 1958.

Table N
Birds Identified in Short Creek Watershed
(October 3-5, 15-19, 1973)(a)

1. Red-tailed Hawk (*Buteo jamaicensis*)
2. Marsh Hawk (*Circus cyaneus*)
3. Sparrow Hawk (*Falco sparverius*)
4. Turkey Vulture (*Cathartes aura*)
5. Ruffed Grouse (*Bonasa umbellus*)
6. Bobwhite Quail (*Colinus virginianus*)
7. Great Blue Heron (*Ardea herodias*)
8. Killdeer (*Charadrius vociferus*)
9. Rock Dove-Domestic Pigeon (*Columba livia*)
10. Mourning Dove (*Zenaidura macroura*)
11. Belted Kingfisher (*Megaceryle alcyon*)
12. Yellow-shafted Flicker (*Colaptes auratus*)
13. Hairy Woodpecker (*Dendrocopos villosus*)
14. Downy Woodpecker (*Dendrocopos pubescens*)
15. Blue Jay (*Cyanocitta cristata*)
16. Common Crow (*Corvus brachyrhynchos*)
17. Carolina Chickadee (*Parus carolinensis*)
18. Robin (*Turdus migratorius*)
19. Eastern Bluebird (*Sialia sialis*)
20. Starling (*Sturnus vulgaris*)
21. Vireo (*Vireo* sp.)
22. Red-winged Blackbird (*Agelaius phoeniceus*)
23. Cardinal (*Richmondena cardinalis*)
24. American Goldfinch (*Spinus tristis*)
25. Dark-eyed Junco (*Junco hyemalis*)
26. House Sparrow (*Passer domesticus*)
27. Field Sparrow (*Spizella pusilla*)
28. Chipping Sparrow (*Spizella passerina*)
29. Tree Sparrow (*Spizella arborea*)
30. Fox Sparrow (*Passerella iliaca*)

Other Species Identified in the Watershed
(March 21 and 22, 1974)

1. Song Sparrow (*Melospiza melodia*)
2. Eastern Meadowlark (*Sturnella magna*)
3. Pileated Woodpecker (*Dryocopus pileatus*)

(a) *Birds of North America* by Chandler S. Robbins, Bertel Bruun, and Herbert S. Zim, Golden Press, New York, 1966.

sycamores are generally abundant throughout that area (See Figures 10, 11, 12, and 13).

The Ohio Department of Natural Resources, Division of Wildlife, has identified 20 species of fishes in the Short Creek Watershed. The distributions and abundances of fish populations in this watershed are affected by variations in the water quality. The section of Short Creek between Adena and the Ohio River is rated as having fair to poor water quality due to coal mine drainage. The following species are found near the mouth of Short Creek: 1/

Largemouth Bass	*Micropterus salmodies*
Smallmouth Bass	*Micropterus dolomieui*
Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis machrockirus*
Green Sunfish	*Lepomis cyanellus*
White Crappie	*Pomoxia annularis*
Carp	*Cyprinus carpio*
White Sucker	*Catostomus commersomi*
Yellow Bullhead	*Ictalurus natalis*
Creek Chub	*Semotilus atromaculatus*
Common Shiner	*Notropis cornutus*

The following species are found in Short Creek between Adena and the Ohio River where water quality is sufficient for aquatic life: 2/

Creek Chub	Common Shiner
White Sucker	Northern Hog Sucker
Carp	(*Hypentelium nigricans*)

The Ohio Division of Wildlife states that the water quality in Short Creek above Adena varies from good to poor. Fair to poor quality sections are found mainly near old surface mines and below Cadiz. They report

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1/ Letter from Dan C. Armbruster, Chief of Division of Wildlife, Ohio Department of Natural Resources, to Robert E. Quilliam, State Conservationist, Soil Conservation Service, Columbus, Ohio, November 23, 1973.
2/ Ibid.

Figures 10 and 11
Two Areas Planned for Channel Work in Piney Fork Just North of Dillonvale Showing Shortages of Wildlife Cover Adjacent to the Stream

Figure 12
A Proposed Channel Work Area at the South Fork of Short Creek in Hagan Addition Just West of Adena

Figure 13
An Area (not planned for channel work) Adjacent to the Location Shown in Figure 12 on the South Fork of Short Creek

also that lengthy sections of streams above Adena have good water quality and considerable fish life. The following species are found in the upper watershed: 1/

Rock Bass	Ambloplites rupestris
Johnny Darter	Etheostoma nigrum
Redside Dace	Clinostomus elongatus
Blacknose Dace	Rhinichthys atratulus
Hornyhead Chub	Nocomis biguttatus
Stoneroller	Campostoma anomalum
Bigeye Chub	Hybopsis amblops
Silverjaw Minnow	Ericymba baccata
Carp	Yellow Bass
Bluegil	White Sucker
Green Sunfish	Creek Chub
Pumpkinseed	Common Shiner
Largemouth Bass	

The Ohio Division of Wildlife has described fishing in the Short Creek Watershed in the following manner:

"Angler use of the watershed is heavy in the area between State Route 7 and the mouth of Short Creek. The bays and channel areas are fished from April until November for largemouth bass, smallmouth bass, white crappie, yellow bullhead, common sucker, bluegill, sunfish, and carp. Fishing is done mainly using live baits but some casting of artificials is done for bass. Angler success near the stream terminus is fair to good. A few bass weighing up to 5 pounds are taken each year. Bluegills, bullheads, and carp are harvested from late spring until fall, Angler use of the watershed above Adena is light and localized. A few rock bass and largemouth bass are taken but the catch is primarily of carp, bullheads, and bluegills. Angler success is fair to poor." 2/

Short Creek supplies the Ohio River with some fishes as well as spawning and feeding areas for the river fishes which move into Short Creek.

1/ Ibid.
2/ Ibid.

General abundances of game birds and game mammals in the watershed have been described by the Ohio Division of Wildlife as follows:

Ruffed Grouse	Medium (1 per 20-40 acres)
Cottontail Rabbit	Medium (200-400 per section)
White-tail Deer	Low to Moderate (less than 75 to 150 per township)
Bobwhite Quail	Low to Moderate (less than 100 to 250 per section)

All of the above density figures are based on fall populations. The Ohio Division of Wildlife described raccoons, opossums, skunks, red foxes, and gray foxes in the watershed as being "present in good numbers." They listed the muskrat population as "fair" and ringnecked pheasants and wild turkeys as "virtually nonexistent" in the Short Creek Watershed.1/

Public access to the streams, fields, and woodlands in this watershed is limited. Nearly all of this land is privately owned, with about 46 percent of the land being in farms and about 30 percent being owned by coal companies.

Cooperative hunting agreements exist between nine landowners in Jefferson County and the Ohio Divion of Wildlife.2/ The landowners allow hunting by permission only, during the regular state hunting seasons.

The following vertebrates are the rare and peripheral species known to exist in the watershed. These species have been found in Jefferson County in which more than half of the Short Creek Watershed is located. 3/

1/ Ibid. and letter from James Keener, Ohio Department of Natural Resources, Division of Wildlife, Columbus, Ohio, to Paul Brady, Soil Conservation Service, Columbus, Ohio, July 31, 1974.

2/ Ibid.

3/ Unpublished data tabulated by H. Granville Smith, Biologist, Soil Conservation Service, Columbus, Ohio.

Rare

Cooper's Hawk	*Accopiter cooperii*
Barn Owl	*Tyto alba praticola*
Orchard Oriole	*Icterus spurius*
Smooth Green Snake	*Opheodrys venalis*

Peripheral

Brown Creeper	*Certhia familiaris americana*

No endangered species are known to exist in the watershed. The river chub (*Nocomis micropogon*) is listed as an endangered species in Jefferson County, but no known collections or observations of this species have been made in the Short Creek Watershed. 1/ 2/

The article, "Rare and Endangered Vertebrates of Ohio," gives the following definitions of dangered, rare, and peripheral species. 3/

Endangered - "An endangered species or subspecies is one whose prospects of survival and reproduction are in immediate jeopardy. The peril may result from one or many causes -- loss of habitat, change in habitat, overexploitation, predation, competition or disease. An endangered species must have help or extinction will probably follow."

Rare - "A rare species or subspecies is one that, although not presently threatened by extinction, exist in such small numbers throughout its range that it may become endangered if its evironment worsens. Close watch of its status is necessary."

1/ *Ibid*.
2/ Milton B. Trautman, *The Fishes of Ohio*, Columbus, Ohio, The Ohio State University Press, 1957.
3/ H.G. Smith, R.K. Burnard, E.E. Good, and J.M. Keener, "Rare and Endangered Vertebrates of Ohio," *The Ohio Journal of Science*, Vol. 73, No. 5, September 1973, p. 257.

Peripheral - "A peripheral species or subspecies is one whose occurrence in the United States (Ohio for this compilation) is at the edge of its natural range and which is rare or endangered within the United States (Ohio), although not in its range as a whole. Special attention is necessary to assure its retention in our nation's (Ohio's) fauna."

5. Recreational Resources

Developed recreational facilities within this two-county area are considered more than adequate for the sparse local population. An estimated 7,000 acres (8.6 percent of the watershed) is presently developed for various forms of recreational use (based on county-wide inventories.1/

Potential exists for increased recreational development in the watershed. An estimated 24,000 acres (30 percent of the watershed) has been stripped for coal and might normally be considered eligible for recreational development. However, reclamation of most of these spoils for grazing use has been quite successful because of their calcareous nature. Therefore, the need to reclassify these lands to uses other than agriculture is probably not as urgent as on acid spoils in other areas.

Coal companies own about one-third of the watershed. These companies will be encouraged to cooperate in the development of outdoor recreational facilities on surface mine spoil.

The rugged relief of the region has aesthetic appeal and readily lends itself to outdoor recreational development.

The Muskingum Conservancy District operates three multipurpose man-made reservoirs (4500 total surface acres) in western Harrison County.2/ Outdoor recreation is a major use at each of these installations.

1/ The Statewide Plan for Outdoor Recreation in Ohio 1971-1977, Part I - Inventory and Resource Analyses, Section VII - Tuscarawas Valley Region, Ohio Department of Natural Resources, October 1970, pp. 58 and 88.

2/ Ibid.

The Ohio Department of Natural Resources, Division of Forests and Preserves, has been developing a reclaimed surface mine spoil area for camping, fishing, hiking, and picnicking. Located outside the watershed about 5 miles north of Cadiz, the area is intended to demonstrate recreational development possibilities for the region. The development has aesthetic and recreational appeal and receives local seasonal use.1/

The Ohio Department of Natural Resources, in its "Statewide Plan for Outdoor Recreation 1971-1977," lists the following recreational facilities located in or near the watershed: 2/

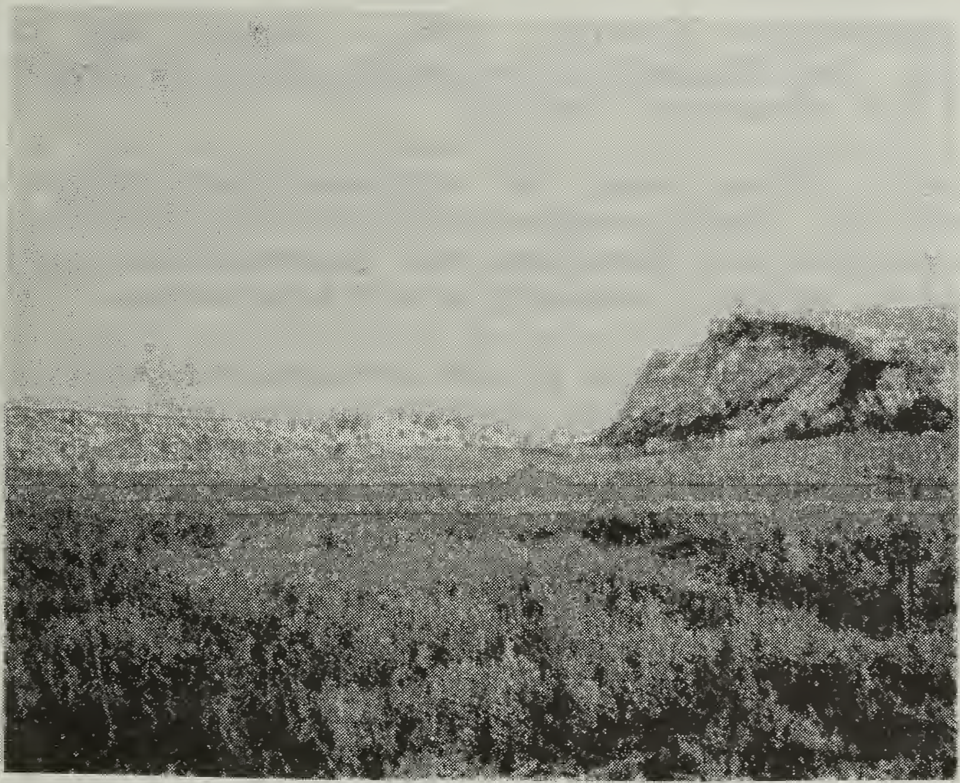
State Route 250	Natural Scenery
State Route 151	Natural Scenery
Roadside Rest (Twp. Rd. 59)	Picnic Tables
Jefferson Co. Fairgrounds	Expositions
Harrison Co. Fairgrounds	Expositions
Harrison Co. Fairgrounds Recreation Area	Village Park
Cadiz Courthouse Square	Village Park
Many Acres Vacation Farm	Open to Public
Kokovich Fishing Lake	Open to Public
Mt. Pleasant Historical Center	Open to Public
Quaker Meeting House State Memorial	Historical Structure
Dillonvale Pool	Swimming
Be-wood Golf Course	Open to Public
Mazeroski Park	Village Park

Resources within the watershed, which may have potential for recreational development, include the following: 227 farms (average size 167 acres) comprising 46 percent of the watershed; and 24,000 acres of coal-stripped land, mostly reclaimed and being used for grazing, as on II-68.

Access to the valley is good via State Routes 150, 151, 152, and 9. U.S. Routes 22 and 250 also traverse the watershed.

1/ Ibid.

2/ Ibid.



Reclaimed Strip-Mined Land in Harrison County utilized for Pasture.

6. Archaeological, Historical, and Unique Scenic Resources

The Soil Conservation Service contacted the Ohio Historical Society in Columbus, Ohio, to ascertain the existence of any known archaeological or historical sites. Since their files were lacking complete archaeological and historical information for the Short Creek Watershed area, the Society recommended that a reconnaissance survey be performed. Such an investigation was subsequently contracted to the Ohio Historical Society by the Soil Conservation Service, and a report was filed describing the Society's reconnaissance of the areas proposed for structural work.1/

The report states that no archaeological sites are described in literary sources which cover Harrison and Jefferson Counties. Therefore, the reconnaissance report was based on personal inspection and interviews.

Within the sediment pool of the proposed reservoir were found three small Indian campsites. Near the limits of the sediment pool was found a rock shelter; and farther away the foundations of a mid-19th century cabin, barn, and springhouse were discovered. The report also notes the existence of a stand of hemlocks near the site of the dam.

Within the area of proposed channel work southwest of Adena are the remains of a mill dating from 1805. A salt works also existed farther downstream dating from the 1830's. According to Charles Wallace, President of the Harrison County Historical Society, neither of these sites is worthy of excavation.

The report also notes the existence of a cultural site in the area of proposed channel work near Dillonvale at the confluence of Short Creek and Dry Fork. This site is known as the Deyarmonville area.

1/ All information in this section was obtained from the following reports by Martha Otto of the Ohio Historical Society: "An Archaeological Survey of the Short Creek Project Area, Harrison and Jefferson Counties, Ohio," (April 2, 1974); and "Archaeological Investigations in the Short Creek Project Area, Harrison and Jefferson Counties, Ohio," (July 19, 1974).

According to the Society's report, none of the archaeological sites warrant nomination to the National Register of Historic Places. However, the report recommends further investigation of the three Indian campsites and the Deyarmonville area.

Additional investigations were conducted at these four areas by the Ohio Historical Society under contract with the Soil Conservation Service. However, no significant historical or archaeological evidence was found at any of these areas.

7. Soil, Water, and Plant Management Status

Land use in the watershed is 15 percent cropland, 16 percent grassland, 10 percent forestland, and 59 percent other land. The other land consists of 30 percent revegetated surface-mined area, 20 percent idle land, and 9 percent miscellaneous. A high percentage of the surface-mined land and the undisturbed land associated with it is controlled by coal companies. There is a trend toward more grassland in both the agricultural land and the other land.

There are 192 Soil and Water Conservation District Cooperators in the watershed, 159 of which have conservation plans for their farms. Forty-two percent of the watershed is covered by cooperative agreements. (A cooperative agreement is an agreement between a landowner and the Soil and Water Conservation District in which the cooperator agrees to apply needed conservation practices on his land). The Soil and Water Conservation Districts in Harrison and Jefferson Counties take an active part in promoting soil and water conservation by conducting tours, holding field days, and having active educational programs.

Thirty-seven different soil and water conservation practices have been planned and applied in the watershed. These practices include contour farming, critical area planting, hedgerow planting, pasture and hayland management and planting, spring development, contour stripcropping, tree planting, upland wildlife habitat management, pond construction, and fish pond management.

From seventy to ninety percent of the conservation practices have been applied by Soil and Water Conservation District Cooperators. A total of 54,286 acres (67 percent of the watershed) has been adequately treated.

Nearly 48,000 acres are in other land. A high percentage of this land is owned by coal interests, and about 24,000 acres has been disturbed by surface mining. Regulation of surface-mined land reclamation is the responsibility of the Ohio Department of Natural Resources, Division of Reclamation.

Nearly all of the inactive surface-mined land has been graded, and revegetative practices have been applied, including about 7,000 acres of tree plantings during the past ten years.

8. Projects of Other Agencies

The Muskingum Watershed Conservancy District, adjacent to Short Creek Watershed on the west, operates recreation facilities at several major reservoirs, which reduce recreation needs in the Short Creek area. The nearest Muskingum reservoir is about 25 road miles from Adena.

Adena has recently installed an expanded sewerage system which is compatible with plans for the proposed project. The village is developing plans to obtain treated water by pipeline from Martins Ferry, Ohio, through the Tri-County Water Authority.

Georgetown has recently installed pipeline water through the Georgetown Water District. Financial assistance is being provided by the Farmers Home Administration.

Hopedale is planning to construct a complete sewerage system, including treatment facilities.

A new highway, which will be the new location of State Route 150, is planned for the Short Creek Valley. The general route follows Middle Fork upstream from Adena and Short Creek from Adena to the Newtown area.

The conservation land treatment and structural measures of the planned project are compatible with the existing and planned water resource development projects in the watershed.

F. WATER AND RELATED LAND RESOURCE PROBLEMS

1. Land and Water Management

The objectives of applying soil and water conservation practices are to reduce soil losses, solve water management problems, and increase income for soil and water conservation district cooperators. Conservation practices have been applied to 10,239 acres of cropland, 8,098 acres of pastureland, and 35,949 acres of other land. The practices consist of a variety of individual measures (in many cases two or more measures on the same acre) designed to adequately protect the soil, water, and plant resources. Some of these practices, along with acres treated, are shown in Table 0.

In the land treatment phase of the project the Soil Conservation Service, Forest Service and others provide technical assistance, but the landowner is responsible for installation and installation costs.

Delays in land treatment on individual farms are due primarily to lack of necessary capital to install the more costly practices such as grassed waterways and diversions. Another reason for land treatment delays is uncertain land tenure due to surface mine operations. Annual progress summaries show steady application for most of the planned practices.

2. Floodwater Damage

The major problem in the watershed is the periodic flooding of about 650 acres of nonagricultural development with a potential for damaging 531 homes, 86 businesses, and 14 miles of public roads. A review of local newspaper files indicates that flooding of these areas in the past has taken the lives of one adult and two children and caused millions of dollars in damage.

More recently floods have occurred in April, 1942; March, 1945; January, 1951; January, 1952; October, 1954; January, 1959; April, 1961; March, 1963; and March, 1964. The most recent severe flood occurred in March, 1963, registering a stage of over 10 feet on the gauge near Dillonvale. This flood claimed one life and caused $153,170 in damages to 439 residential properties

Table O
Selected Land Treatment Measures Applied by June 30, 1973

Practice	Description	Amount and Unit
Contour Farming	Plowing, planting, and cultivating sloping land on the contour to reduce erosion and rainfall runoff.	6,794 Acres
Critical Area Planting	Planting vegetation on critical soil loss areas to control erosion.	8,964 Acres
Hedgerow Planting	Establishing a hedgerow or living fence of shrubs or trees within, across, or around a field to provide wildlife habitat.	60,000 Feet
Livestock Exclusion	Excluding livestock from an area such as woodland or wildlife areas where grazing is not desired.	1,184 Acres
Pasture and Hayland Management	Proper treatment and use of pasture and hayland to maintain vegetative cover and control erosion.	8,098 Acres
Pasture and Hayland Planting	Establishing or re-establishing long-term stands of perennial plants to provide grazing and control erosion.	6,025 Acres
Spring Development	Improving springs and seeps by excavating, clearing, capping or providing collection and storage for efficient use of water.	94 No.
Strip Cropping	Crops systematically arranged so that a strip of grass or close growing crop is alternated with a strip of clean-tilled crop to control erosion by water.	8,918 Acres
Tree Planting	Planting tree seedlings or cuttings to improve the timber stand and control erosion and runoff.	6,973 Acres

Table O Cont'd

Practice	Description	Amount and Unit
Upland Wildlife Habitat Management	Retaining, creating, or managing wildlife habitat to the advantage and benefit of upland wildlife species.	2,731 Acres
Ponds	Constructing a dam or embankment to store water for wildlife, recreation, or other planned use.	90 No.
Fish Pond Management	Managing ponds to produce sustained yields of game fishes for sport fishing.	90 No.
Conservation Cropping System	Growing crops in combination with needed cultural and management measures to protect cropland.	10,239 Acres
Land Adequately Protected	Land used within its capability on which have been applied conservation practices that are essential for its protection and improvement.	54,286 Acres

and $102,497 in damages to 67 commercial establishments (both figures are 1963 dollars). The estimated damages to residents ranged from a high of about $4,500 to a low of $25. The commercial damages ranged from over $7,000 to about $50. The stage of this flood (which varied from reach to reach) was equivalent to that of between a 5 and 10-year storm frequency.

The flood of April, 1961, produced less than nine feet of stage at the gauge but caused damage at many points. This was similar to a flash flood and provided little time for preparation.

The perpetual damage threat has a dampening effect on the local economy, similar to the effect of an additional tax millage. Although most of the farming operations are in the uplands, about 600 acres of agricultural land (mostly cropland) are subject to flooding.

3. Erosion Damage

The following table lists ranges of average annual erosion rates for major land uses and types of erosion in tons per acre per year:

Table P
Average Annual Erosion Rates (Tons/Acre)

Land Use	Sheet and Rill	Gully	Roadside
Cropland	7.64	Trace	Trace
Pastureland	2.20	Trace	Trace
Forest Land	2.15	Trace	Trace
Other Land	1.95	Trace	Trace

Streambank erosion on Short Creek mainstem, North Fork, South Fork, Middle Fork, and 20 unnamed tributaries (about 240 total stream miles) is estimated to comprise about 3500 tons per year, 2000 tons of which are transported out of the watershed. The estimated average annual erosion rate is about 14.6 tons per linear stream

mile (both banks), 8.4 tons of which is yielded to the Ohio River. The other lands have been separated into idle, revegetated surface mine, and miscellaneous lands, which experience an estimated average annual soil loss of 1.95, 2.25, and 0.95 tons per acre, respectively.

Based on examination of recent aerial photographs and field reconnaissance, no detailed studies of gully erosion were warranted in the Short Creek Watershed since no critical areas were observed.

4. Sediment Damage

There are no significant areas of infertile overwash that would reduce soil productivity of the flood plains. Accumulations of stream bed materials are found as occasional shoals in the main stem, particularly at the junctions of major tributaries. About 52,600 tons of suspended sediment or 408 parts per million are delivered annually from the watershed to the Ohio River. Bed materials consist of about 19 percent sand which is carried by flow in suspension about 7 percent of the time. Total discharge of bedload, sand size and larger, is estimated to be 10,200 tons annually. 1/ The estimated total annual sediment discharge is 62,800 tons.

5. Drainage Problems

About 1,750 acres or about 14 percent cropland in the watershed needs surface or subsurface drainage improvement. An estimated 47 percent of the watershed's cropland currently has adequate conservation treatment, including drainage treatment.

Where drainage improvement is needed, crop yields are lowered because of excessive root zone moisture and consequent delayed tillage and harvest operations.

Local drainage improvement efforts have been limited by the small size of projects and the lack of economical contracting for small jobs.

1/ Information received in letter from Rogers C.B. Morton, Secretary of the Interior, to Kenneth E. Grant, Administrator, Soil Conservation Service, June 1, 1973.

The watershed's major streams have enough depth and flow capacity to provide adequate gravity outlets for field drainage systems. The watershed's drainage needs are mainly for individual farm systems rather than for deeper, larger outlet channels.

6. Irrigation Problems

Irrigation is not used in crop production in the watershed. High value specialty crops are not grown in commercial quantities, and there is no anticipated future need for irrigation in the watershed.

7. Municipal, Industrial, and Rural Water Problems

Existing surface water resources are inadequate to supply the municipalities in the watershed. Adena utilized surface storage reservoirs in 1962, abandoning its well field 2.5 miles to the north in a heavily surface-mined area. It has since been found that treated water is available economically from Martins Ferry, Ohio, via pipeline. The municipal water supply at Dillonvale is currently obtained from wells which tap shallow alluvium. 1/ A dug well which had been used previously for municipal water supply has been abandoned. Mount Pleasant has been buying water from Dillonvale and is now arranging to obtain water by pipeline from an Ohio River city. Georgetown is also planning to obtain pipeline water.

Although good surface water quality is often lacking, wells in rural areas usually are adequate for domestic use. Their sustained yield is generally less than five gallons per minute, the source of this water being consolidated sandstone, shale, limestone, and coal bedrock. Farm ponds and spring developments have been installed on many livestock farms to provide necessary water. Higher sustained yields are realized from the heterogeneous unconsolidated Recent alluvium which occurs in the flood plain of Short Creek and its major tributaries. 2/

1/ Personal interview with Richard Neal, Dillonvale Water Director, at Dillonvale on March 14, 1974.

2/ James J. Schmidt, Ohio Water Plan Inventory, 1959, "Short Creek and Wheeling Creek Basins, Underground Water Resources," Columbus, Ohio, Department of Natural Resources, Division of Water.

Villages in the watershed are finding ground water supplies inadequate for expanded future needs. Future supplies for municipalities and rural residents are expected to come from outside the watershed by pipeline because of limited ground water supplies and lack of economical, high quality surface water supplies in the watershed.

8. Recreational Problems

Water pollution sources in the Short Creek Watershed include refuse, coal mine drainage, and untreated and partially treated sewage. It is unlikely that present water quality will permit water-based recreational development.

All land is privately owned and is, therefore, generally unavailable for public recreational access.

The population of the watershed is currently about 10,000. The population density of the two-county area ranges from 44 to 246 people per square mile.1/ The higher density area is along the industrialized area of the Ohio River. Population is not expected to increase in the watershed during the future because of continued loss of agricultural land to surface-mining activity. Population pressures from the north and east can be expected to continue to increase with a resultant increase in the demand for outdoor recreational activities in the surrounding areas. The present comprehensive development of the Muskingum River Basin for water-based recreational facilities is adequate for the Short Creek Watershed population.2/ Three such developments are located within 25 miles of Adena. The need for additional outdoor recreational facilities may increase in the future as a result of population pressures from outside the watershed.

1/ The Statewide Plan for Outdoor Recreation in Ohio 1971-1977, Part 1, Section VII Tuscarawas Valley Region, Ohio Department of Natural Resources, October 1970, pp. 58 and 88.

2/ Ibid.

9. Plant and Animal Problems

The plant communities and landscape patterns have been changing in the watershed and continue to change due mainly to the extensive surface mining operations for coal, but also due to land use changes resulting from variations in farming practices. Coal companies own about one-third of the land and have surface-mined about 24,000 acres in the watershed.

Surface mining has converted cropland, pastureland, forest land, and other areas into the following: ponds surrounded by rock walls and steep hillsides; spoil areas revegetated with black locust, crown vetch, or other hardy plant species; or piles of rock and sterile soil.

Surface mining has substantially increased the numbers and acres of ponds and lakes in the watershed, creating habitats for certain aquatic vertebrates and invertebrates, amphibians, and other wildlife. However, these mining operations have also destroyed terrestrial habitats for farm and forest wildlife species. Reclamation procedures for the mined areas have replaced some of this habitat, but extensive areas of rocks and sterile soil remain unreclaimed, unsightly and of benefit neither to wildlife nor man.

Attempts to reclaim other surface-mined areas have had various degrees of success. A basic problem concerning wildlife potentials on surface-mined land is that certain plants (such as black locust and crown vetch) which are often established on surface mine spoil areas are of limited value as food and shelter for wildlife.

Other major land use changes (trends) taking place in the watershed include the conversion of cropland to pastureland and wildlife land. These trends have diminished certain types of wildlife food and shelter, but have increased other types of habitat. Some fields of corn, wheat, soybeans, and other crops which provide food and limited shelter for rabbits, woodchucks, muskrats, quail, certain nongame birds, and other wildlife have been converted to pastureland and/or wildlife land.

Pastures provide the following: food for some species such as rabbits and deer; areas for woodchuck borrows (which may also be utilized by rabbits); and limited cover for small birds and game animals, depending on the heights of the grasses.

Wildlife land referred to above consists of weeds, brush, and some trees and shrubs in various early stages of succession. These areas provide various qualities and quantities of wildlife food and shelter, depending on the abundances and species composition of the plants.

Drainage from surface-mined areas and deep mines (See Figures 14, 15, and 16) in the watershed, municipal sewage wastes, (See Figure 17) and refuse dumping have and continue to pollute streams in the watershed. Such pollution (described in the Water Quality Problems section) leads to decreases in the population of smallmouth bass, rock bass, bluegills, and other game fishes, as well as aquatic invertebrates intolerant of such water pollution. Carp, catfish, certain suckers, and certain invertebrates which can tolerate polluted waters tend to increase in areas such as the Short Creek Watershed. Carp and suckers were the most abundant adult fishes observed during the Soil Conservation Service studies in the watershed during September and October, 1973.

Flooding in the watershed has an adverse effect on certain species of wildlife. Floods inundate wildlife food, shelter, travel lanes, burrows, and ground nests, and can drown newborn birds and mammals.

The direct effects of flooding on animals themselves is greatest on the ground nesting birds and nests or burrows of young animals such as rabbits, woodchucks, skunks, rats, and mice. Adult mammals such as white-tail deer, foxes, and rabbits can quickly leave the area being flooded, although they may be temporarily concentrated near the flood margins. Climbing species, such as squirrels, find refuge in trees, but may be stranded if the flood persists. Woodchucks normally spend much of their time in burrows and occasionally may be trapped there by flood water.

Figure 14
Deep Mine Wastes Piled Within 200 Yards of Short Creek Between Newtown and Olszeski Town, Jefferson County

Figure 15
Deep Mine Wastes Piled Along Short Creek Just East of Newtown, Jefferson County

Figure 16
Ditch Carrying Polluted Water From a Deep Coal Mine to the North Fork of Short Creek, 0.5 Mile Northwest of Unionvale, Harrison County

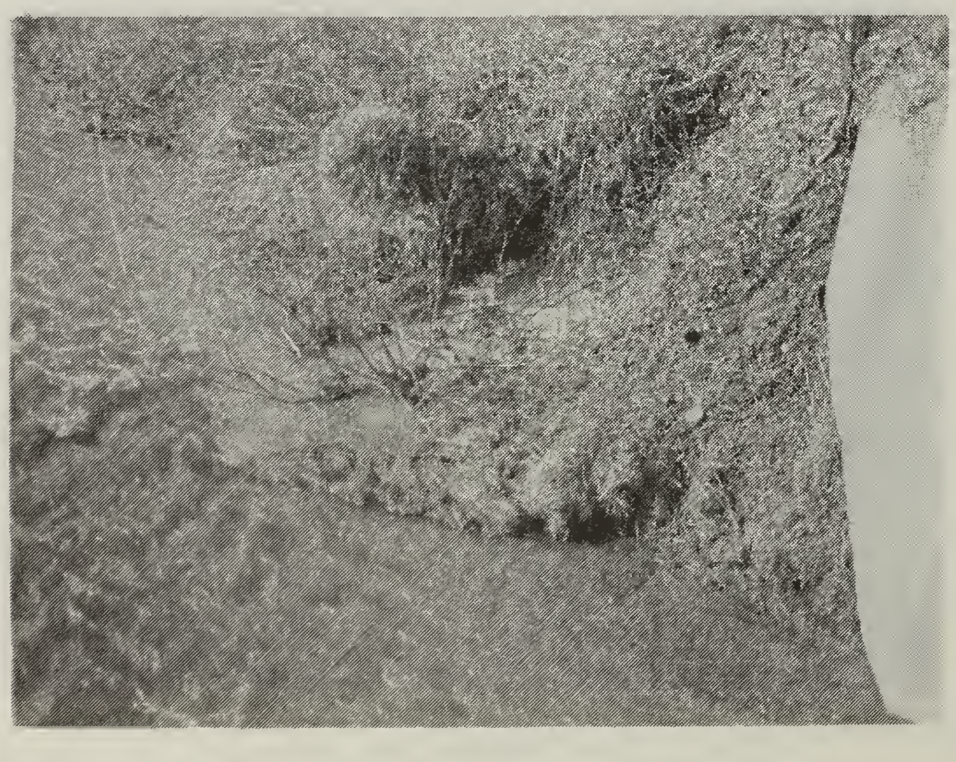


Figure 17
Domestic Wastes Entering the North Fork of Short Creek at Unionvale

Erosion in the watershed has had a minor adverse effect on terrestrial wildlife. The resulting sedimentation and turbidity have had a larger impact on aquatic life in the streams. Sediment is gradually decreasing stream volumes in some areas, covering habitat for some aquatic invertebrates, and altering the habitat sufficiently to change the species composition of these invertebrates in some areas.

Periodic turbidity resulting from erosion decreases light penetration which decreases the photosynthetic zone of the stream. This results in a decrease in phytoplankton, organisms of primary importance in the food chains of lakes and streams, and thereby lowers the productivity of the water.

Additional fish and wildlife habitat is usually desired by the hunter, fisherman, and nature enthusiast. Increases in the quantity and quality of terrestrial habitats and quality of the aquatic habitats in the Short Creek Watershed are needed. Poor stream water quality and barren spoil piles in the area downgrade or completely destroy the environments and habitats for aquatic, terrestrial, and avian fauna. Human residents and visitors in the watershed have little scenic beauty to enjoy, and outdoor enthusiasts have a generally low quality environment in which to pursue their recreational interests.

10. Water Quality Problems

Fish and wildlife habitats in the Short Creek Watershed were studied by the Soil Conservation Service on September 5, 6, 25, 26, and October 3, 5, 15, and 19, 1973. The main study areas involved eleven aquatic areas and seven terrestrial areas in and adjacent to the North Fork, Middle Fork, mainstem of Short Creek, and at Piney Fork. These study areas were located within the areas proposed for channel work and the reservoir site. Reconnaissance surveys were also made of aquatic and terrestrial environments in other areas as well as observations of the woody and herbaceous cover conditions throughout the watershed.

Chemical analyses of the stream water at the main study areas involved measurements of total alkalinity, pH,

dissolved oxygen (DO), carbon dioxide, and total hardness. This information and some physical parameters of the streams are listed in Table Q.

Total hardness of the water at each of the study areas was greater than 250 mg/l. (The upper limit of measurement of the reagents used for this test is 250 mg/l.) These hard water conditions and the high alkalinity values at nearly all of the study areas help to provide a biologically productive habitat with a larger variety of organisms.

The pH readings (averaging 7.8) and dissolved oxygen (averaging 8.4) at the study areas were generally within favorable ranges for aquatic life. However, carbon dioxide levels (averaging 31.1 mg/l) were unfavorable at nearly all of the study areas. From a fish management standpoint, the amount of free carbon dioxide in water is important ". . . .because it is perhaps the best single criterion of environmental suitability for fishes. In general free carbon dioxide exceeding 20 mg/l is considered harmful to fishes, and lower values may also be harmful in water having a dissolved oxygen content of less than 3 to 5 mg/l." 1/ Only three of the 15 carbon dioxide readings at the study areas were less than 20 mg/l and two of the readings exceeded 60 mg/l.

The United States Environmental Protection Agency states that an ". . . .interim water quality management plan for pollution abatement for southeast Ohio tributaries has been tentatively approved, but is presently not complete. Specific water quality standards have not been set for this stream (Short Creek) because of the proported acid mine drainage problem and the minimum treatment goal that was established for secondary treatment." 2/

Extensive coal mining, municipal sewage wastes, and common refuse dumping are main sources of pollution in

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1/ Karl F. Lagler, Freshwater Fishery Biology, William C. Brown Company, Dubuque, Iowa, pp. 254 and 255.

2/ Letter from Donald A. Wallgren, Chief, Federal Activities Branch of the United States Environmental Protection Agency, Chicago, Illinois, to Robert E. Quilliam, Columbus, Ohio, April 9, 1973.

Table Q
Stream and Pond Survey Data from Short Creek Watershed

	Study Area	Date (1973)	Temp °F Air	Temp °F H_2O	Bottom Type	Depth (ft.)	Av. Width (ft.)	Pool-Riffle Ratio (ft.)	Total Alkalinity (mg/l)	pH	D. O. (mg/l)	CO_2 (mg/l)	Total Hardness (mg/l)
1.	Mid. Fk. Short Cr.	9-26	71	64	Mud, Rubble	0.3-0.8	12-35	3/25	190	8.6	11	20	250+
2.	Mid. Fk. Short Cr.	9-5	86	79	Rock, Gravel	0.3-0.5	15-35	6/27	160	8.8	12	8	250+
3.	Short Cr.	10-3	79	70	Mud, Rocks	0.5-1.0	20-30	17/19	240	8.5	9	24	250+
4.	Short Cr.	9-5	80	75	Mud, Rubble	0.3-0.5	35-50	6/14	200+	8.2	12	16	250+
5.	North Fk. Short Cr.	9-26	77	73	Mud, Rocks, Gravel	0.3-1.5	15-35	3/4	160	8.2	9	28	250+
6.	Short Cr.	9-6	75	75	Sand Gravel	0.3-0.7	45	6/1	130	6.9	9	36	250+
7.	Short Cr.	9-25	81	79	Mud, Rocks	0.75	30	1/9	130	7.5	7	48	250+
8.	Short Cr.	10-3	82	70	Mud, Gravel	0.3-1.5	40-50	4/1	160	7.6	9	24	250+
9.	Dry Fk. Short Cr.	10-3	84	72	Mud	0.4-0.7	4-6	4/1	240	7.9	6	28	250+
10.	Long Run	10-4	73	64	Mud, Rocks	0.2-0.4	6-8	7/13	30	6.3	4	64	250+
11.	Piney Fork	10-3	82	73	Mud, Gravel	0.2-0.5	8-15	7/3	170	8.0	8	28	250+
12.	Pond at Sally Buffalo Park	10-17	-	-	-	-	-	-	200	8.1	9	8	250+
13.	Surface-mine Pond in Rose Valley	10-17	-	-	-	-	-	-	140	8.3	8	24	250+
14.	Pond just north of jct. of Rts. 151 & 23	10-18	-	-	-	-	-	-	250+	7.8	9	28	250+
15.	North Fk. of Short Cr. jct. of Rts. 12 & 13	10-18	-	-	-	-	-	-	40	6.4	4	82	250+
	AVERAGES		-	-	-	-	-	-	162.6+	7.8	8.4	31.1	250+

character," and stated that it produced sulfuric acid and acid-producing salts through oxidation. These products accumulated during dry weather and were intermittently transported to Perrin Run by runoff from heavy rainfall. Such conditions resulted in acid-slugging of the streams since the transported acid overcame the natural alkalinity of the receiving stream. (A sample of effluent from the mine refuse dump had a pH of 2.0, acidity of 4300 ppm (M.O.) and 8600 ppm (phenolph), iron-2140 ppm, and sulfates-9019 ppm).1/

Drainage from underground coal mines and numerous surface-mined areas throughout the watershed continue to carry pollutants into Short Creek and its tributaries. Some streams, especially Long Run and sections of Short Creek downstream from Long Run, periodically contain extensive amounts of an orange-red iron oxide precipitate, and Long Run's water occasionally has a yellowish-orange color. Coal particles, sometimes covering the stream bottom, can be found in some streams in the watershed.

The concentrations of iron precipitates and coal detritus in the streams of the watershed are functions of weathering processes and the intensity of mining activities.

Table R, S, and T list water quality information gathered during 1966-1974 in the watershed. Hardness, sulfate, dissolved solids, specific conductance, and most carbon dioxide values were all too high for good water quality and general suitability for aquatic life. However, pH and dissolved oxygen values were generally at desirable levels for aquatic life.

Although less severe than mining pollution sewage wastes significantly pollute streams in the watershed. The Ohio Department of Health found that the bluish gray effluent from the Cadiz Sewage Disposal Plant accounted for about 10 percent of the stream flow in the Middle Fork of Short Creek on June 4, 1968. During drought periods, they estimated that it contributed about 50 percent or

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1/ Letter from A.L. Fishback, Ohio Department of Health, July 3, 1968.

TABLE R

Water Quality Data Collected from Short Creek
Near Dillonvale by the U.S. Geological Survey
(June 29 - August 9, 1966) a/

Test Parameter	No. of Samples	Maximum	Minimum	Mean
Water Temperature - °C (°F)	6	25(77)	18(64.4)	21.5(70.7)
Stream Flow - CFS	6	131.0	24.0	89.66
Turbidity - JTU*	3	100.0	56.0	73.33
Conductivity - Micromho	6	2,600.0	2,200.0	2,354.17
Dissolved Oxygen - Mg/L	6	8.7	6.8	7.58
pH -	6	7.5	6.6	7.15
Total Alkalinity - Mg/L	6	145.0	110.0	127.17
Total Hardness - Mg/L	6	2,560.0	920.0	1,475.67
Total Sulfate - Mg/L	6	1,750.0	300.0	698.33
Iron - ug/l	6	16,800.0	1,100.0	6,666.66
Manganese - ug/l	6	3,300.0	0.0	1,166.67
Aluminum - ug/l	6	16,200.0	4,000.0	9,950.00
Total Acidity - Mg/L	6	15.0	0.0	5.00

a/ Data received with letter from Valdas V. Adamkus, Acting Regional Administrator of the U.S. Environmental Protection Agency, Chicago, Illinois, to Robert E. Quilliam, January 3, 1974.

* JTU - Jackson Turbidity Units

Table 5
Water Quality Data Collected from Short Creek
Near Dillonvale by the U.S. Geological Survey (1969-1972)a/b/

Test Parameter	No. of Samples	Maximum	Minimum	Mean	Collection Period
Temperature - °F	34	72.0	32.0	54.6	10/23/69-9/19/72
Stream Flow - C.F.S.	58	2230.0	21.0	224.3 (153.9)*	10/23/69-9/19/72
Bicarbonate - Mg/l	3	200.0	92.0	153.3	11/24/69-8/26/71
Carbonate - Mg/l	3	0	0	0	11/24/69-8/26/71
Sulfate - Mg/l	9	1600.0	610.0	1148.9	11/24/69-7/28/72
Chloride - Mg/l	14	95.0	20.0	55.0	11/24/69-7/28/72
Nitrate (NO_3) - Mg/l	7	4.3	0.6	2.47	1/22/71-7/28/72
Total Phosphorus - Mg/l	2	3.8	1.1	2.45	9/21/70 & 8/26/71
Dissolved Solids - Mg/l	3	2580.0	2030.0	2350.0	11/24/69-8/26/71
Hardness - Mg/l	9	1400.0	720.0	1088.9	11/24/69-7/28/72
Specific Conductance - Micromhos	25	2890.0	846.0	2086.6	11/24/69-9/7/72
pH	9	8.0	6.8	7.65	11/24/69-7/28/72
Suspended Sediment - Mg/l	26	3490.0	4.0	327.3 (200.8)*	10/23/69-9/19/72
Suspended Sediment Discharge (Tons/Day)	26	21,000	0.57	892.66 (88.4)*	10/23/69-9/19/72

*Mean values calculated by excluding the two highest values for stream flows (2230&2160) and by excluding the highest values for suspended sediment (3490 mg/l) and sediment discharge (21,000 tons/day).

a/Data received with letter from Robert Wysenski, Division of Surveillance, Ohio Environmental Protection Agency, Twinsburg, Ohio, to Paul M. Brady, Soil Conservation Service, Columbus, Ohio, October 29, 1973.

b/Data received with letter from R. Michael Hathaway, U.S. Department of Interior, Geological Survey, Columbus, Ohio, to Paul M. Brady, Columbus, Ohio, March 12, 1974.

TABLE T
Stream Water Analyses in Short Creek Watershed
by Private Consultants (Water Samples Collected on January 22, 1974)*

Sampling Site**	Stream	Time	Turbidity	Suspended Solids, Total	Temperature	Dissolved Oxygen	B.O.D. (5-day)	pH	Alkalinity (as $CaCO_3$)	Total Iron	Sulfate (as SO_4)	Nitrates (as N)	Phosphates (as PO_4)
		(PM)	(Jackson Units)	(mg/l)	(°C)	(mg/l)	(mg/l)	(Units)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
1	Middle Fork	12:30	<5	8.0	6.1	9.2	26	7.7	121	0.5	729	<1.0	0.03
2	Middle Fork	12:45	<5	24.4	6.3	9.6	1	8.0	144	0.2	754	<1.0	0.11
3	South Fork	1:05	<5	23.4	7.2	9.8	96	8.1	242	1.0	1394	2.0	0.01
4	Middle Fork	1:00	<5	12.0	6.6	10.0	154	8.1	134	0.1	727	2.0	0.05
5	Flag Run	1:40	<5	5.5	8.3	10.4	255	8.0	196	0.5	234	2.0	0.12
6	North Fork	1:50	<5	36.0	7.2	9.1	167	7.7	101	1.5	661	<1.0	0.01
7	Short Creek	2:00	<5	14.5	7.2	9.9	153	8.0	153	1.0	861	1.5	0.07
8***	Short Creek	2:10	<5	17.0	7.2	8.7	144	8.0	144	1.0	849	<1.0	0.16
9	Goose Run	2:30	<5	8.0	7.9	10.1	233	8.1	233	0.5	796	<1.0	0.12
10	Short Creek	2:40	<5	13.0	7.2	9.1	152	8.0	152	1.0	771	1.5	0.18
13	Long Run	3:10	6	7.5	8.7	9.4	194	7.8	194	4.0	258	2.0	0.19
14	Short Creek	3:20	<5	17.0	7.3	9.2	151	7.9	151	1.1	268	<1.0	0.03
15***	Short Creek	3:50	<5	20.0	7.4	8.7	154	7.9	154	2.0	749	2.0	0.04
16	Short Creek	4:10	<5	19.0	7.7	8.7	148	7.7	148	3.0	796	1.5	0.11
17	Short Creek	4:20	9	22.5	7.7	9.5	147	7.8	147	3.0	778	<1.0	0.01
18	Piney Fork	4:35	23	52.0	8.3	9.3	131	7.9	131	2.0	506	<1.0	0.12
19	Short Creek	4:45	10	43.0	7.9	9.0	139	7.8	139	3.0	1077	1.5	0.09
20	Dry Fork	4:50	7	10.5	8.6	10.1	241	8.2	241	1.0	589	1.5	0.15
21	Short Creek	5:05	10	35.0	8.1	9.7	151	7.9	151	3.0	781	<1.0	0.13
22	Short Creek	5:20	7	38.0	7.9	9.6	160	8.0	160	2.9	766	1.5	0.24
23	Short Creek	5:30	8	34.0	7.9	9.7	149	7.9	149	3.0	757	<1.0	0.06
24	Short Creek	5:50	8	42.5	7.9	10.3	149	7.9	149	3.0	738	<1.0	0.47
25	Little Short Creek	6:00	25	22.5	8.6	10.4	132	7.8	132	7.5	391	<1.0	0.06
26	Short Creek	6:15	9	39.0	7.9	10.0	148	7.9	148	3.1	655	<1.0	<0.01
	AVERAGE		< 7.8	23.5	7.6	9.6	148.9	7.9	158.9	2.03	703.5	< 1.3	<0.11

*Temperature measurements were made by Rackoff Associates, 2200 Lockbourne Road, Columbus, Ohio; all other analyses were performed by Nalin Laboratories, 2541 Cleveland Avenue, Columbus, Ohio; and all of this data was obtained from Rackoff Associates.
**Sites 11 and 12 were tentative and not sampled; therefore, numbering is nonsequential. Sampling locations are shown on Figure 4, page II-
***Site 8 is downstream from the new Adena Sewage Treatment Plant; site 15 is downstream from spoil banks on both sides of the stream below Newtown.

a/Data received with letter from Robert Wysenski, Division of Surveillance, Ohio Environmental Protection Agency, Twinsburg, Ohio, to Paul M. Brady, Soil Conservation Service, Columbus, Ohio, October 29, 1973.

b/Data received with letter from R. Michael Hathaway, U.S. Department of Interior, Geological Survey, Columbus, Ohio, to Paul M. Brady, Columbus, Ohio, March 12, 1974.

more of the stream flow.1/ Table U summarizes water quality data collected at the Cadiz Sewage Treatment Plant from January 1973 through January 1974.

Four watershed communities have sewage treatment facilities: Cadiz 0.40 million gallons per day usage; Adena 0.14 m.g.d.; Dillonvale 0.12 m.g.d.; and Rayland 0.1 m.g.d. The plants at Cadiz and Adena have secondary treatment, while those at Dillonvale and Rayland have only primary treatment.2/ Adena's plant has chlorination facilities, but they are currently not being used. With only primary treatment and no chlorination facilities, Dillonvale will have to upgrade their treatment to secondary.3/

The only known large industrial discharge in the watershed that does not have adequate secondary treatment is the Deluca Packing Company in Warren Township, Jefferson County. Effluent from this plant flows into Connorville Creek, a tributary of Short Creek.4/

11. Economic and Social Problems

The economic and social problems of the watershed center around the economic development of the area. In general, the soils have been fairly productive which has encouraged exhaustive use from the time of early settlement. However, because of the thin topsoils, steep slopes, and poor farming practices, many of the farms became marginal or submarginal operations. In recent years large acreages have reverted to low-grade pastures and forests. Sizeable acreages have been surface-mined and need to be reclaimed to become useful again.

1/ Ibid.

2/ Letter from Robert Wysenski, Ohio Environmental Protection Agency, Twinsburg, Ohio, to Paul Brady, Soil Conservation Service, Columbus, Ohio, October 29, 1973.

3/ Letter from Donald A. Wallgren, Federal Activities, Branch of the U.S. Environmental Protection Agency, Chicago, Illinois, to Robert E. Quilliam, Columbus, Ohio, April 9, 1973.

4/ Ibid.

Table V

Data from Annual Summary of Operations
for the Cadiz Sewage Treatment Plant a/

Month in 1973	Average Flow (Gallons/Day)	Suspended Solids After Final Treatment (PPM)	5-Day Bio-chemical Oxygen Demand (PPM)			Dissolved Oxygen (PPM)		
				Stream			Stream	
			Final	Above	Below	Final	Above	Below
January	705,200		34	10	16	9.1	12.77	11.51
February	815,700		28	6	10	8.6	12.60	11.80
March	941,600		36	7	10	6.8	10.30	9.40
April	923,700	16	23	4	6	6.0	10.60	10.00
May	1,010,516	15	23	4	6	6.0	9.50	9.00
June	628,500	9	26	3	6	6.6	8.40	7.80
July	320,000	9	48	3	3	5.5	8.00	7.30
August	285,000	8	56	4	11	5.0	7.70	7.20
September	169,433	7	70	8	21	4.4	7.60	6.60
October	281,000	7	51	8	12	5.2	8.90	7.90
November	547,000	10	30	5	7	5.2	7.40	6.90
December	586,000	13	39	10	8	5.4	6.90	7.10
AVERAGE	601,100	10	39	6	10	6.15	9.22	8.54
January-74	736,400	12	35	11	11	8.0	10.6	9.4

a/ From a report submitted to the Ohio Department of Health and obtained from Frederick Klingelhafer, Southeastern District Office, Ohio Environmental Protection Agency, Logan, Ohio, February 11, 1974.

Because of these developmental conditions, nearly all farms in the watershed are family operations and nearly 60 percent are parttime operations. Nearly 15 percent of all family incomes in the watershed are below poverty level, and roughly 14 percent of the rural farm incomes are in the same status. 1/ The entire watershed is within the area designated under the Appalachian Regional Development Act of 1965.

1/ U.S. Department of Commerce, Bureau of Census, 1969 Census of Agriculture, (Washington, D.C., September 1971)

II RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

A formal land use plan does not presently exist in the project area. It is recognized by all levels of government involved that unwise land use decisions over the past several years have helped to create the existing problems. While this project will provide protection to existing development in the flood plain, the Sponsors were urged to enact ordinances to prohibit further development in flood hazard areas. Appendix D contains aerial photographs of the villages of Adena and Dillonvale and the community of Newtown, delineating the 100-year flood with and without the project. To minimize future damages, the Local Sponsoring Organizations have agreed to publicize this information at least annually. The Sponsors also have agreed to prevent, to the extent possible, development (both new and reconstructed) in the area subject to flooding by the 100-year event. The Ohio Department of Natural Resources will assist the Sponsors in developing land use controls to effectively guide land use in the flood plains.

There are currently no communities in either Jefferson or Harrison Counties, Ohio, eligible for flood insurance, according to the United States Department of Housing and Urban Development, Federal Insurance Administration, Washington, D.C.

III ENVIRONMENTAL IMPACTS

A. CONSERVATION LAND TREATMENT

1. Land Adequately and Partially Protected or Treated

Conservation land treatment measures are being applied throughout the watershed by 192 landowners cooperating with the Harrison and Jefferson Soil and Water Conservation Districts. These measures are being applied according to 159 conservation plans, including forest management plans, and will result in planting and improving the cover conditions on 9,625 acres of pastureland, 7,650 acres of cropland, and 560 acres of forest land. These measures, coupled with the development of farm ponds, water control structures, wildlife habitat plantings, and critical area plantings on about 7,325 acres of miscellaneous land, will reduce erosion and sediment production by 1,225 tons per year. These land treatment measures will also increase opportunities for recreation and enjoyment of natural areas and improve the general watershed aesthetics.

Increases in overall efficiency in crop production, rates of moisture storage, improved cover conditions, decreased needs for commercial fertilizers, and reduced erosion will result from the land treatment practices applied to cropland and pastureland throughout the watershed. There will also be an increase in private swimming areas, fish habitat, and livestock watering facilities through the development of ponds and springs on other land.

2. Erosion and Sedimentation

The average rate of gross erosion from all sources in the Short Creek Watershed will be about 2.89 tons per acre per year (on an average annual basis) with installation of the proposed project.

No significant areas of infertile overwash onto the flood plain have been identified, nor will any deposition of infertile overwash be induced by installation of the project.

With project installation, about 46,300 tons of suspended sediment per year 1/ (average annual) or about 26.57 acre-feet of suspended sediment per year will be yielded to the Ohio River from the Short Creek Watershed. The present rate of suspended sediment yield is about 52,600 tons per year 2/ (average annual) or about 30.19 acre-feet per year. The project results in a 12 percent reduction in suspended sediment yield, equal to 6,300 tons per year, or 3.62 acre-feet per year.

Average annual suspended sediment concentration will be about 360 parts per million (or milligrams per liter) with project installation. The present average annual suspended sediment concentration is estimated to be 408 parts per million, so that the project will reduce suspended sediment concentration by about 48 parts per million or 12 percent.

3. Aquatic and Terrestrial Habitats

Conservation land treatment measures applied to cropland, grassland, and forest land in the watershed will increase the areas of terrestrial and aquatic habitats and improve their environmental qualities.

Critical area plantings of trees, shrubs, grasses, or legumes on about 1400 acres will provide food, shelter, and/or nesting areas for cottontail rabbits, bobwhite quail, a variety of nongame birds, and other wildlife, depending on the species and acres planted of woody and/or herbaceous vegetation.

About 3,000 acres will be managed specifically for improving wildlife food and shelter conditions. Trees, shrubs, grasses, and legumes will be retained or planted on various areas using methods and plant species which will help to maximize benefits for deer, rabbits, quail, a large variety of nongame birds, and other wildlife.

1/ Based on information received in a letter from Peter Antilla, U.S. Geological Survey, Division of Water, to Leonard Myers, Soil Conservation Service, Columbus, Ohio, February 13, 1974.
2/ Ibid.

The eight ponds to be constructed as part of the land treatment measures in the watershed will provide habitat for largemouth bass, bluegills, channel catfish, and certain other warm water fishes as desired by the pond owners for sport fishing. These ponds will also create environmental conditions suitable for certain species of turtles, frogs, snakes, waterfowl, wading birds, furbearers such as muskrats, and a multitude of aquatic invertebrates.

Other land treatment measures, such as contour farming, critical area planting, diversion channels, grassed waterways, pasture management, strip cropping, and terraces as well as the trees, shrubs, and grasses to be planted, will help to prevent runoff, increase infiltration, and prevent soil erosion. Decreases in erosion rates and sediment yields will reduce the rates at which pools, riffles, and other stream areas are filled as well as decrease the covering effect of sediments on stream bottom organisms and their habitats. Decreases in erosion and sedimentation will also decrease stream turbidity which will increase light penetration, thus increasing the photosynthetic zone. This process will tend to increase the primary productivity of aquatic life food organisms.

4. <u>Water Quality</u>

Conservation land treatment measures will have an overall beneficial effect on water quality in the Short Creek Watershed. Erosion and subsequent sedimentation will be reduced by improvement of cover conditions and reduction of suspended sediment in streams. Structures to be included as part of the conservation land treatment will affect water quality. Debris basins below areas of serious erosion will trap sediment, decreasing stream loads, and animal waste storage and disposal facilities will retain concentrated organic pollutants which would otherwise enter the streams.

5. <u>Economic and Social</u>

Land use changes will occur throughout the watershed with or without the project. These changes will occur as the surface-mined land is reclaimed and returned to a productive use. However, the accelerated land treatment

program will bring about additional land use changes. Farm ponds, spring developments, critical area development, wildlife habitat development and other practices will be applied to 7,325 acres of land not classified as miscellaneous. Woodland grazing will be controlled on 80 acres by constructing 10 miles of fences. About 350 acres of open land will be reforested, making the land use more compatible with soil and slope conditions.

The project will reduce mosquito production due to the reductions in flooding and increases in field drainage by means of grassed waterways and subsurface drains installed as part of the project's land treatment measures. Without the project, habitat for mosquito nests and larval development would be provided by excess water spread over a larger area during flooding and the sloughs, puddles, and other areas of trapped water formed when floods recede, or where the soils are poorly-drained.

Water pollution reduction will be realized from the installation of debris basins to trap sediment and disposal facilities to store animal wastes. General watershed aesthetics will be improved by the reduced flooding, reduced water pollution, fewer eroded areas and the increases in natural vegetation. The overall effect will be an improved environment.

6. Water Management

Conservation land treatment measures such as critical area plantings, pasture and hayland planting and management, contour farming, will increase infiltration by retaining water on the land surface for longer periods, decreasing overland flow, and thereby reducing flood peaks and consequent flood damages by two to three percent.

Other land treatment measures (such as diversions, grassed waterways, and subsurface drains) installed as part of the project will improve water management in the watershed. These measures will remove excess water from poorly-drained cropland and pastureland and will supply water to ponds for recreation or livestock use.

Base flow, or the average low flow of perennial streams except during periods of prolonged drought, is expected to increase slightly with the project because conservation land treatment measures will increase rainfall infiltration time during storm periods.

7. Ground Water

Effects of land treatment measures on the ground water table will be marginal in that base flow of perennial streams will be slightly increased due to more infiltration time and less direct runoff. Any increases in ground water recharge will be insignificant compared to the total ground water regime of the watershed.

Published information by the Sponsors concerning areas flooded by the 100-year frequency storm will create a greater public awareness of flood hazards.

B. STRUCTURAL MEASURES

1. Aquatic and Terrestrial Habitats

The proposed flood prevention reservoir will be built for eventual use as a wet sediment pool structure, but will be constructed as a dry pool until the upstream water quality in the Middle Fork of Short Creek has increased sufficiently to be suitable for impoundment, as judged by the Ohio Environmental Protection Agency and the Ohio Department of Natural Resources, Division of Wildlife.

The temporarily dry sediment pool of the Fox Bottom Reservoir will affect about 2.2 miles of stream habitat. The stream will overflow its banks more often in the dry sediment pool area due to the flow-retarding effect of the reservoir. The stream channel may accumulate sediment within the dry sediment pool and may be forced to follow a new course in some of the pool area.

The reservoir will periodically inundate an additional 5.8 miles of natural stream in the Middle Fork of Short Creek for floodwater storage. When the water quality of this stream improves sufficiently and the permanent sediment pool is created in the reservoir, about 2.2

miles of stream will be permanently inundated. Such inundation will change the aquatic environment either permanently or periodically from a stream to a lake habitat. The degrees to which the aquatic vertebrates and invertebrates are affected by the subsequent changes in their habitats will depend on the types and degrees of those changes and each species' ability to adapt to them.

Values of the stream reach to be inundated such as for raccoon feeding areas, waterfowl and wading bird habitat, stream fishing, and aesthetic qualities will either be changed temporarily or be completely foregone.

The reservoir (including its dam, spillway, sediment, and detention pools) will eventually alter the land uses and wildlife habitat either periodically, temporarily or permanently on 379 acres. This includes 314 acres in the detention pool (68 acres of which will eventually be changed to permanent pool) to be periodically altered, 58 acres in borrow and work areas to be temporarily altered, and seven acres on the dam and spillway areas to be permanently altered. Periodic flooding of 314 acres in the detention pool will disturb agricultural, wildlife, and recreation use. The impoundment of 68 acres of permanent water behind the dam when pollution abatement on the Middle Fork of Short Creek is realized, will preclude present land uses and create 68 acres of aquatic habitat.

The estimated present land uses of the areas to be inundated or altered by structural measures are listed in Table V.

Table V
Estimated Present Land Uses in Acres
To Be Inundated or Altered by Structural Measures

Structures	Total Acres Required	Crop-land	Pasture-land	Forest Land	Other
Fox Bottom					
Reservoir a/	379	84	179	93	23
Channel Work	266	46	5	47	169
TOTAL	645	130	184	140	192

a/ Sediment and detention pools, dam, spillway, flowage rights, and borrow areas.

Present conditions will be permanently changed on the 266 acres disturbed by channel work. The natural pool and riffle configurations of the streams will be altered by the widening and deepening of the 10.0 miles of channel. The stream bottoms will be constructed in a manner that will concentrate low flows to help maximize water depths during periods of low rainfall.

Normal depths of the modified stream sections will be increased. In some areas, composition of the present stream bottom materials may be altered, thus forming new habitat types for aquatic life, especially for the benthic organisms. Fish cover, such as weeds, tree limbs, and logs, will be removed from some areas of the streams.

The channel work will displace and decimate benthic organisms and other sedentary or slow-moving fauna. Fish and free swimming vertebrates will be forced to migrate from the areas during construction. As channel work proceeds upstream, the fishes will be forced upstream for the most part. The nearest channel work in this project is 8.14 miles away from the Ohio River, and none of the channel work is expected to have any significant effects on the movement of fish populations into the Ohio River.

Species and population sizes of aquatic organisms which return and become established in the modified channels will depend on the ecological factors of the new habitats and the requirements of the individual species.

Project measures will alter water temperatures in several ways, but these measures are expected to have little <u>overall</u> effect on stream temperatures. Channel work is planned on 10 miles of stream, which is eight percent of the 120 miles of Short Creek, its forks, and major tributaries, exclusive of the 113 miles of smaller creeks in the watershed. Tree clearing along certain areas of the channel work will remove sufficient shade from the streams to raise water temperatures. However, the generally deeper flows expected in the modified channel areas will tend to promote lower water temperatures than existed in these areas prior to channel work.

When the sediment pool of the Fox Bottom Reservoir is used for permanent water storage, the discharge will be from the pool surface. The temperature effects of this discharge on Short Creek will depend on the volume and temperature differences of the two sources being mixed.

Increases in subsurface drainage (a land treatment measure) are expected to increase the volume of cooler subsurface water entering the streams.

In the modified segments of channel, the project will generally decrease cross-sectional flow areas for comparable storms. Flow depths, however, will increase for some channel sections because the channel will be deepened more than the water surface is lowered. Flows depths for comparable storms are expected to increase from zero to about five feet with the project. Flow depths during low flow periods will remain about the same or increase due to channel designs for concentrating low flows. Water velocities will generally increase for comparable flow rates because the project will reduce channel retardance in modified channel areas.

Erosion, sedimentation, and turbidity will increase temporarily and add to the adverse effects on the aquatic environment during and after project construction until streamside vegetation is reestablished.

The temporary increases in sedimentation resulting from streambank erosion will tend to increase the time required for the streams to return to their more natural conditions conducive to aquatic life which existed prior to channel work.

Turbidity decreases light penetration which decreases the photosynthetic zone. This results in a decrease in phytoplankton, organisms of primary importance in the food chains of lakes and streams, and thereby lowers the primary productivity of the water.

As streamside vegetation becomes established and land treatment measures are installed, erosion, sedimentation, and turbidity will decrease. With the planned project maintenance these forces will be kept at levels lower than those before the project.

About 47 acres of woody vegetation and 82 acres of miscellaneous land uses will be cleared during construction of the channel work. This will include removal of border or edge consisting of grasses, weeds, shrubs, and trees along the streambanks. This border provides food, cover, nesting areas, and travel lanes for wildlife. The impacts on wildlife due to removal of this habitat will be greatest in the wooded areas on the western and eastern outskirts of Adena, southwest and northeast of Dillonvale, and an area on the south side of Short Creek across from the Dillonvale business district. Most of the remaining areas proposed for channel work are bordered by residential areas, surface mine spoil piles, or other areas of low value for wildlife habitat.

All plant species identified in the watershed areas to be affected by structural measures have been listed in the "Environmental Setting" section. Table W lists the <u>major</u> plants (besides bluegrass, orchard grass and other common grasses) identified at study areas which will be affected by project measures.

Food, shelter, and breeding areas for wildlife in the channel work areas will be provided by planting 29.0 acres of trees, 11.2 acres of shrubs, and 6.6 acres of grasses and legumes (46.8 acres total). This will include about 51,600 feet of border along the modified sections of stream and at certain odd areas in the vicinity. These plantings will consist of selected species of trees, shrubs, and grasses especially suited to provide wildlife habitat and an aesthetically pleasing environment. Upon reaching maturity (4-8 years for some species depending on soil qualities, fertilization, moisture, and other factors), these plants will furnish cover, food, and nesting areas of higher quality than most of the habitat currently present in the project area. Grasses and legumes will provide wildlife food and shelter about one year after planting. Wildlife displaced by channel work will gradually repopulate these areas as the plants grow and begin to furnish food and cover.

On a short-term basis, channel work will reduce the quantity of wildlife in the watershed until the vegetation matures sufficiently to provide food and cover. In

Table W
Major Plants and Trees to
be Affected by Project Measures a/

Structural Areas	Major Trees	Other Significant Trees	Major Herbaceous Plants
Channel Work Areas	Sycamore Willows Box Elder Slippery Elm American Elm	Silver Maple Red Maple Ninebark Cottonwood Ohio Buckeye	Healall Asters Goldenrod Wild Carrot Foamflowers Fleabanes Coneflowers Ground Ivy
Fox Bottom Reservoir Site (including sediment and detention pools)	Sycamore Box Elder Willows	Sugar Maple Red Maple American Elm Ninebark Eastern Hemlock White Oak Red Oak Shagbark Hickory	Goldenrod Asters Ground Ivy Wild Carrot Red Clover Crown Vetch Common Ragweed

a/ The scientific names for all these plants and trees, except white oak, Quercus alba, and shagbark hickory, carya ovata, are listed in Table M.

the long-term, habitat for wildlife such as cottontail rabbits, bobwhite quail, and certain songbirds will be enhanced by the mitigation measures. Woodland species such as raccoons, fox squirrels, and woodland birds will be displaced for a longer period of time with a net loss in their populations corresponding to the amount of their habitat altered.

Type 1 wetlands (seasonally flooded basins or flats) in the watershed will be reduced in channel work areas, from 661 acres to 319 acres. Table X shows the acres of Type 1 wetlands which will be reduced at the various reaches of streams where channel work is planned.

Table X

Reductions in Areas of Type 1
Wetlands by Channel Work

Reach	Type 1 Wetland (acres)		
	Before Project	After Project	Reduction
South Fork from tributary at Duncanwood to junction with Middle Fork	18	3	15
Main Stem Short Creek from junction with South and Middle Forks to junction of North Fork at Adena	25	0	25
Short Creek from North Fork to Perrin Run	142	23	119
Short Creek from Perrin Run to Long Run	28	13	15
Short Creek thru Dillonvale from Long Run to Piney Fork	113	4	109
Short Creek from Piney Fork to end of project area at Little Short Creek	300	255	45
North Fork from Rose Valley to junction with Short Creek at Adena	21	21	0
Piney Fork from NW $\frac{1}{4}$ of SW $\frac{1}{4}$ of Sec. 8 of Smithfield Township to junction with main stem of Short Creek	14	0	14
Total	661	319	342

Reductions of Type 1 wetlands will be due to the structural measures of the project designed for flood prevention. The 342 acres of Type 1 wetlands being reduced are the areas being flooded each year adjacent to the proposed channel work.

Reducing these seasonally flooded areas will reduce (during time of flooding) the temporary resting areas for waterfowl, temporary habitat for muskrats, mink, wading birds, fishes, turtles, frogs, aquatic invertebrates, and various other mammals, birds, reptiles, and amphibians which migrate away from the streams with the rising water or are attracted by increased areas of aquatic environments. Breeding areas for mosquitos and certain other aquatic oriented parasites will also be decreased by the reductions of Type 1 wetlands.

Project structural measures will reduce Type 1 wetlands and will also decrease the flooding damages to roads, bridges, farmsteads, buildings, equipment, machinery, cropland, pastureland, and other human developments in the watershed.

Construction of the dam at the Fox Bottom Reservoir site will necessitate drainage of a farm pond with a surface area of about 0.5 acre. This will result in destruction of habitat for fishes, turtles, frogs, muskrats, waterfowl, wading birds, and other vertebrates as well as aquatic invertebrates. Recreational and water supply values of this pond will also be foregone.

The 26.8 acres of Types 3, 4, 6, and 7 wetlands, located at Short Creek just upstream from its confluence with the Ohio River at Rayland, are the only other significant wetlands (besides Type 1 wetlands) which are found along Short Creek (See Table X).

These 26.8 acres of wetlands were mainly created by backwater from artificially increased stage in the Ohio River. Increased rates of sedimentation during construction will have an adverse effect on this wetland area. Turbidity levels will increase slightly during construction, and sediment will have some covering effect on aquatic plants and the benthic region of the wetlands.

The American eel, common white sucker, hog sucker, and other anadromous fishes may be affected by project measures. These fishes inhabit the Ohio River and may journey into the Short Creek Watershed to spawn. Their migrations up the Middle Fork of Short Creek would be affected when the Fox Bottom Reservoir gate is eventually closed and water is impounded. However, these fishes would still have access to the reaches of Short Creek and its tributaries downstream from the reservoir.

Habitat to be disturbed by this project is neither of extent nor uniqueness to have significant effect on the four rare species (Cooper's hawk, barn owl, orchard oriole, and smooth green snake) or the one peripheral species (brown creeper) which have been found occasionally in the watershed.

The means for gaining access to streams in the watershed will be increased by the creation of the maintenance berms, but no provisions for public parking areas, sanitary facilities, recreation areas, or other public facilities have been made. The construction of maintenance berms along the modified channel will provide an opportunity for incidental recreational use in the form of walking and hiking. The potential will exist on a year round basis, but at the discretion of the affected landowners. Persons desiring access to private lands must obtain permission from the landowners.

2. Area Available for Agricultural Production

Agricultural production will be temporarily interrupted or permanently foregone on an estimated 130 acres of cropland in areas of proposed structural work. Construction of the Fox Bottom reservoir will permanently preclude production on about 60 acres of cropland, which will be inundated or consigned to permanent reservoir operational functions. During reservoir construction, approximately 24 acres of cropland will be temporarily disrupted for removal of borrow materials or for ingress and egress. Construction of the design channels at Dillonvale and Adena will either permanentaly or temporarily alter agricultural production on about 46 acres of cropland. All other cropland in the vicinity of these structural measures will be unaffected.

3. Relocation of Homes, Roads, and Bridges

Due to partial inundation by the Fox Bottom Reservoir, changes will be required on Township Roads 77, 78, and 79. Township Roads 77 and 78 will not serve as the primary access roadways for any residences near the reservoir after it is constructed and the residents are relocated. Alternate routes for Township Road 78 are available about one mile south and 2.5 miles north of Fox Bottom. An alternate route about one mile north of the reservoir on Penova Ridge Road is available for Township Road 79. One family will travel about one mile farther to this outlet after reservoir construction. Surface-mined land served by Township Road 77, which has no outlet north of Fox Bottom, can be reached by a private roadway. About 19,000 feet of Harrison County Road 15 will be inundated but will not require an alternate route because the road is to be replaced by State Route 150.

Road flooding will be reduced downstream from the reservoir, in the channel work areas, and downstream from these areas. The 100-year water surface profiles in Appendix E show lowered flood stages with the project. For example, the 100-year flood at the State Route 150 bridge on Piney Fork in Dillonvale (Station 818+55) will be lowered about three feet in elevation to below the low chord of the bridge.

Construction of the Fox Bottom Reservoir will result in the relocation of seven rural family dwellings, one mobile home residence, two owner-operated farms, and one rental farming operation.

The following impacts will result from these relocations:

a. Life styles will be disrupted. Relocated families must adjust to new schools, new neighborhoods, etc.

b. Access to public utilities and conveniences will change.

c. Temporary inconveniences of moving and relocating will occur.

d. Distance to recreation facilities from new location will change.

e. The owner of one rental farming operation will lose ownership and income rental fees. The tenant farmer will lose residence and income.

4. Land Subject to Flooding

Project action will reduce the losses of 650 landowners on 1,424 acres. Project effects on the area flooded are shown in Table Y.

Table Y
Flood Frequencies and Areas Flooded

	Area Flooded in Acres a/					
	Without Project			With Project		
Flood Frequency	Urban b/	Rural c/	Total	Urban b/	Rural c/	Total
Two-year Flood	135	574	709	0	343	343
100-year Flood	488	936	1,424	102	728	830

a/ Includes channel water surface.
b/ Includes roadways and other.
c/ Cropland, pastureland, and forest land, and other.

The Fox Bottom Reservoir will reduce peak discharges on Short Creek, but part of the reduction will be offset by channel work. The net effect of all project measures will be lower peak discharges both within the study area and downstream on Short Creek to its junction with the Ohio River. Appendix E shows the flood elevations near the downstream end of the project area with and without the project.

The peak flow rates for the 2, 10, and 100-year floods will be reduced 8 percent, 24 percent, and 37 percent, respectively, at the downstream end of the project area.

Project measures will have an insignificant effect on Ohio River flows. Table Z shows the expected project effects on maximum channel flow rates.

Table Z
Storm Frequencies and Maximum Stream Flow Rates

	Maximum Flow in Cubic Feet Per Second					
	Short Creek Below Jct. of Middle and South Fork			Short Creek Near Downstream End of Project Area		
	Without Project	With Project	Change	Without Project	With Project	Change
Two-year Storm	1,150	550	-600	3,350	3,100	-250
Ten-year Storm	3,000	1,200	-1,800	8,100	6,100	-2,000
100-year Storm	5,200	2,400	-2,800	13,850	10,700	-3,150

Conservation land treatment and structural measures will alter stream flow durations after storms. On Short Creek at a point downstream from the junction of Middle and South Forks, for example, durations for channel flows half full and greater will be reduced by the Fox Bottom Reservoir and conservation land treatment. At a point near the downstream end of the project area, flow durations will increase for various storms. Table AA shows the expected flow durations with and without the project.

5. Streambank Erosion and Flood Plain Scour

The extent to which streambank erosion will be reduced by project measures is shown in Table BB.

Some shallow scour areas exist below Dillonvale where overbank flows tend to cut across stream meanders on the main stem. Becuase of the limited extent of these areas, no special studies were deemed necessary.

Table AA
Estimated Flow Durations in Hours

	Short Creek Below Jct. of Middle and South Fork			Short Creek Near Downstream End of Project Area		
Storm Magnitude	Without Project	With Project	Net Change	Without Project	With Project	Net Change
2-Year Storm						
Bank Full	0	0	0	9	14	+ 5
Half Full	12	0	-12	21	24	+ 3
10-Year Storm						
Bank Full	0	0	0	17	17	0
Half Full	17	16	- 1	26	27	+ 1
100-Year Storm						
Bank Full	4	0	- 4	22	20	- 2
Half Full	19	16	- 3	28	44	+16

Table BB
Average Annual Streambank Erosion

	Present Without Project	Future With Project	Change
Erosion	14.6 tons/mi.*	12.7 tons/mi.*	-1.9 tons/mi.*
	3500 tons	3050 tons	-450 tons
Sediment Yield	8.4 tons/mi.*	7.3 tons/mi.*	-1.1 tons/mi.*
	2000 tons	1750 tons	-248 tons

*Tons per linear stream mile, both banks.

6. Air and Noise Pollution

Ambient air quality during dam construction and channel work will be affected mainly by dust and, to a lesser extent, by exhaust gases from construction machinery. The amount of dust generated will depend on the soil

moisture conditions in construction area, the sizes and numbers of machines in operation, and the amount of machine back-tracking.

Another impact during construction will be the noise created by the bulldozers, draglines, and other machinery. Noise impacts will be greatest in the residential and business areas of Adena and Dillonvale where most of the channel work is located. The human population in the dam construction area is sparse and scattered compared with populations near Short Creek at Adena and Dillonvale.

C. ECONOMIC AND SOCIAL

1. Flooding

The structural measures will reduce urban damages to 86 businesses and 531 homes by over 95 percent. Damages to transportation facilities will be reduced by nearly 85 percent. Average annual agricultural damages will be reduced by about 33 percent. The project will reduce the threat of injury, loss of life, and health hazards associated with unsanitary conditions resulting from flood damages. Such hazards include drowning, contamination of water supplies, and mosquito population.

The reduction in floodwater damage will encourage economic growth. Additional employment opportunities will follow any new industrial developments. Over $28,000 in secondary benefits will be generated annually by this project. These are values added over and above the immediate products or services of the project as a result of activities of increased production, added purchases, and construction of the project itself. This is sometimes referred to as the multiplier effect and can have significant effects from the local viewpoint.

2. Employment

Population projections do not indicate any significant increases in the labor force of the watershed; however, as the surfacemining activities decrease, there will likely be some dislocations and labor surpluses. The construction of project measures will increase opportunities for seasonal employment resulting from renewed agriculture and the maintenance of structural measures.

3. Places of Archaeological, Historical, or Scientific Value

The Ohio Historical Society has conducted a preliminary reconnaissance archaeological investigation in the Short Creek Watershed and a more detailed investigation of certain sites found during the reconnaissance study. The results of these studies, as described in the Environmental Setting section, indicate that the project's proposed land treatment measures and structural measures will have no effect on any archaeological or historical values.

D. INTERNATIONAL IMPACTS

No known international impacts will result from the Short Creek Watershed Project.

E. FAVORABLE ENVIRONMENTAL IMPACTS

a. Increased conservation farming systems and farming efficiency on 9,625 acres of pasture land, 7,650 acres of cropland; increase the level of forest land management on 560 acres; and improve water management and cover conditions on 7,325 acres of miscellaneous land.

b. Increase opportunities for recreation and enjoyment of natural areas and improve general watershed aesthetics.

c. Reduce soil erosion which will reduce the total average annual sediment yield of the watershed to the Ohio River by 6,300 tons (a 12 percent reduction).

d. Reduce the average annual suspended sediment concentration by about 48 parts per million (a 12 percent reduction).

e. Improve and increase wildlife food and shelter conditions on about 4,400 acres (1,400 acres of critical area plantings and 3,000 acres managed for wildlife purpose).

f. Land treatment measures will reduce stream turbidity and reduce the covering effect of sedimentation on aquatic habitats.

g. Improve water quality by reducing erosion and sedimentation.

h. Improve water quality by installing animal waste disposal systems which will trap and hold wastes which would ordinarily enter streams.

i. Reduce mosquito production by reducing flooding and improving field drainage.

j. Increase infiltration of water into soil (due to certain land treatment measures) which will reduce flood peaks and damages by two to three percent.

k. Remove water from poorly drained cropland and pasture land by land treatment drainage measures, some of which will also supply water to ponds for recreation and livestock uses.

l. Increase slightly base flow of watershed streams through ground water recharge as a result of more infiltration and less direct runoff.

m. Create a greater public awareness of flood hazards by periodic publication of information about areas flooded by 100-year frequency storms.

n. Create wildlife habitat in channel work areas totaling 46.8 acres, including 51,600 feet of border, by planting trees, shrubs, and grasses especially suited to provide wildlife food and shelter, and eventually create 68 acres of aquatic habitat.

o. Maintain lower erosion, sedimentation, and turbidity levels after structural measure establishment periods than at present.

p. Reduce area flooded from 709 acres to about 343 acres for the two year frequency floods and from 1,424 acres to 830 acres for the 100-year frequency event.

q. Reduce peak flow rates for the 2, 10, and 100-year frequency floods by 8, 24, and 37 percent, respectively, at the outlet of the project area.

r. Reduce average annual streambank erosion by 450 tons, a 13 percent reduction, and reduce sediment yield from streambank erosion by 248 tons, a 12 percent reduction.

s. Reduce urban damages to 86 businesses and 531 homes by over 95 percent.

t. Reduce damages to transportation facilities by nearly 85 percent.

u. Reduce average annual agricultural damages by about 33 percent.

v. Reduce the possibilities of illness and loss of life due to drowning, contamination of water supplies, and mosquito production associated with periodic flooding.

w. Encourage economic growth by encouraging industrial development which would lead to additional employment opportunities.

x. Generate over $28,000 in secondary benefits resulting from increased production, added purchases, and construction of the project.

y. Increase opportunities for seasonal employment due to revived farming operations and the maintenance of project structural measures.

F. ADVERSE ENVIRONMENTAL IMPACTS

a. Periodically inundate approximately 5.8 miles of natural stream conditions which would change or forego the stream habitats for aquatic life, stream values for other wildlife, stream fishing values and aesthetics.

b. Induce flooding in the dry sediment pool area of the reservoir and perhaps increase sedimentation and alter the flow pattern of 2.2 miles of natural stream within the dry sediment pool.

c. Periodically disturb the agricultural, wildlife, and recreational uses on 314 acres in the detention pool of the reservoir (68 acres of this area will eventually be changed to a permanent pool) and temporarily disturb about 58 acres at the borrow areas and other work areas.

d. Permanently alter present land use on seven acres of dam and spillway areas.

e. Alter 266 acres due to channel work.

f. Change the natural pool-riffle configurations and remove aquatic flora, logs, and other cover for aquatic life from 10.0 miles of streams.

g. Increase normal depths and water velocities and change stream bottom compositions on 10.0 miles of streams.

h. Reduce the populations of fishes, amphibians, aquatic invertebrates, and other aquatic life in the construction areas of the channel work until these areas return to more natural conditions.

i. Increase or decrease water temperatures in various areas of the watershed's streams.

j. Temporarily increase erosion, sedimentation and turbidity during construction of the channel work and reservoir, adversely affecting aquatic habitats.

k. Destroy 47 acres of woody vegetation by channel work until wildlife plantings can be established.

l. Reduce the populations of game birds, song birds, mammals, and other terrestrial creatures where channel work disturbs stream side vegetation until the flora has been restored.

m. Reduce Type 1 wetlands by 342 acres.

n. Drain one farm pond (about 0.5 acre in area) and forego the aquatic habitat and recreational values therein.

o. Possibly block migration of American eels, suckers, and other anadromous fishes up the Middle Fork of Short Creek.

p. Temporarily interrupt or permanently preclude agricultural production on 130 acres of cropland in areas proposed for structural works.

q. Inundate parts of Harrison County Road 15 and Township Roads 77, 78, and 79.

r. Relocate eight family dwellings and three farming operations.

s. Disrupt life styles of relocated people, resulting in adjustments to new living conditions, new neighborhoods, and new schools.

t. Change access of relocated people to public utilities, conveniences, and recreation facilities.

u. Create temporary inconveniences of moving and relocating for the relocated people.

v. Eliminate rental income for one owner of a rental farming operation, and eliminate the residence and farm income for the tenant farmer.

w. Change stream flow durations after storms.

x. Increase dust, exhaust gases, and noise during construction of the dam and channel work.

IV ALTERNATIVES

A. ACCELERATED CONSERVATION LAND TREATMENT AND EIGHT RESERVOIRS WITHOUT CHANNEL WORK

Accelerated conservation land treatment and nine reservoir sites were evaluated without channel work. A reservoir site on Piney Fork, which would replace four smaller sites, was also studied. The Piney Fork site is not economical unless the railroad in the reservoir area is abandoned. Since the railroad is apparently not scheduled for abandonment, studies of this site were discontinued. A coal mine facility installed in Rose Valley after preliminary reservoir studies were completed has made a reservoir site in this valley uneconomical.

Accelerated conservation land treatment and the eight remaining floodwater detention reservoirs would provide about a five-year level of flood protection at Adena and Dillonvale, except along Piney Fork in Dillonvale, where about a 12-year protection level would be provided. The estimated cost of installation, operation, and maintenance is $6,861,000 or $421,300 each year with interest at 6 1/8 percent and a project life of 100 years.

The accelerated conservation land treatment measures and their effects in this alternative would be the same as described in Alternative C.

The eight reservoir sites with their approximate drainage areas in square miles are listed below:

Cabbage Run	1.6	Little Piney Fork	3.0
Fox Bottom	23.0	Long Run	3.3
Harmon Creek	2.8	Perrin Run	5.2
Henderson Run	1.4	Thompson Run	1.2

The reservoir sediment pools range in size from 5 to 68 acres, comprising a total surface area of 159 acres. The maximum flooded area at the reservoirs range from 20 to 333 acres, and the total area subject to flooding is 586 acres. The dams, spillways, and outlet channels occupy areas from 6 to 18 acres, and the total land for this use is 65 acres.

About 23,000 feet of county and township roads would be closed, raised, or relocated; and about 13 residences located in the reservoir areas would be displaced.

By trapping sediment and releasing floodwaters more slowly, the eight reservoirs would alter downstream water clarity, velocity, temperature and flow duration, thus changing downstream aquatic habitat. Aquatic stream habitat would be changed to lake habitat in the sediment pools. About 24,000 feet of existing streams would be inundated by water in sediment pools, which would be expected to slowly diminish in size as sediment is accumulated. The pools would initially provide habitat for aquatic vertebrates and invertebrates, waterfowl, wading birds, and certain mammals, and reptiles. About 586 acres of cropland, woodland, surface-mined land, and land in other uses would become subject to flooding in the reservoirs, periodically altering the habitat for upland wildlife species.

B. ACCELERATED CONSERVATION LAND TREATMENT AND THREE MILES OF CHANNEL WORK

The accelerated conservation land treatment measures described in Alternative C could be combined with an earlier U.S. Army Corps of Engineers channel work proposal. The Corps of Engineers proposed 5,465 feet of channel work at Adena and 10,600 feet at Dillonvale. Measures to mitigate losses to wildlife habitat are not included in this alternative project. The estimated average annual cost of installing, operating, and maintaining this project is $335,100. The equivalent one-time cost is $5,457,100 with 6 1/8 percent interest rate and a project life of 100 years.

Flood protection for Newtown and Olszeski Town upstream from Dillonvale is not an objective of this alternative, nor is protection along Piney Fork at Dillonvale or along North Fork at Adena. The alternative project would provide flood protection along Short Creek at Adena for greater than the 48-year peak flow and along Short Creek at Dillonvale for 88-year peak flows.

Less habitat would be disturbed along the streams with this project than with the proposed project. No relocations of dwellings, less land use change, and lower land

costs would result from this project compared with an all-reservoir project; and it would provide a greater level of protection for areas along Short Creek at Adena and Dillonvale.

About nine acres along the streambanks would be converted from existing land uses to stream channel use and about 31 acres of land would be used for spoil placement.

The effects of the accelerated conservation land treatment measures would be as described in Alternative C.

C. ACCELERATED CONSERVATION LAND TREATMENT

Another alternative for solving the water and related land resource problems is to apply conservation land treatment measures exceeding those expected to be applied with no project. The land to be treated and typical practices for each land use are shown in Table CC. Some measures would be applied on more than one land use. For example, diversions may be installed on cropland or other land.

These measures would improve the conservation farming systems for cropland and hayland, increase the level of forest land management, and improve the balance of land uses. Benefits from reduced surface runoff, reduced sedimentation, enhanced wildlife habitat, and improved visual resources would be the same as for the proposed project. Current losses from floodwater, sediment, flood plain scour, and related damages would be reduced about two to three percent. The estimated average annual installation, operation, and maintenance costs of this alternative are $156,700. With an interest rate of 6 1/8 percent and a project life of 100 years, the comparable one-time cost is $2,552,000. The costs of reapplying repetitive practices such as conservation cropping systems and crop residue management are not included in the cost estimate.

D. ACCELERATED CONSERVATION LAND TREATMENT AND FLOOD PLAIN LAND USE CONTROL

A nonstructural alternative for alleviating water and related land resource problems is to supplement an

Table CC
Accelerated Conservation Land
Treatment as a Project Alternative

Land Use	Area to be Treated	Typical Conservation Land Treatment Measures
Cropland	7,650 Acres	Conservation cropping systems, contour farming, crop residue management, surface and subsurface drains, grassed waterways or outlets, contour stripcropping.
Pasture and Hayland	9,625 Acres	Pasture and hayland plantings, pasture and hayland management, spring developments.
Forest Land	560 Acres	Livestock exclusion, tree plantings, woodland improved harvesting, woodland improvement.
Other Land	7,325 Acres	Debris basins, disposal lagoons, diversions, ponds, recreation trails and walkways, wildlife upland habitat management.

accelerated conservation land treatment program by regulating flood plain use. Some or all new development and replacement of existing buildings could be prohibited. The accelerated conservation land treatment program and its effects would be the same as described in Alternative C.

Land suitable for urban development is scarce in the area. Urban development in the flood plain initially occured because of the availability of water.

Most of the flood plain buildings are over 20 years old; few have been added in recent years. Regulations prohibiting new flood plain buildings could gradually become effective in reducing floodwater damages as the existing buildings become unserviceable. Without replacement of buildings, the character of flood plain neighborhoods would change as they convert from urban or

rural residential use to other uses less subject to flood damage. Some observers might consider the urban neighborhoods to be in an undesirable state of decay when buildings are neither renewed nor removed.

Erosion and sediment damages affecting improvements other than buildings would be unaffected by this alternative. If utilities, transportation facilities, and other damageable developments were allowed to exist and be maintained in the flood plain, floodwater damages to these facilities would continue.

Costs of the land use control portion of this alternative are primarily administrative and are estimated to be $3,980 yearly. Capitalized at 6 1/8 percent interest, the equivalent cost is $65,000 for a 100-year project life. The estimated total yearly cost of the alternative is $160,700; the capitalized equivalent cost at 6 1/8 percent interest is $2,617,000.

E. ACCELERATED CONSERVATION LAND TREATMENT AND FLOOD PROOFING

An alternative to supplement accelerated conservation land treatment measures in reducing flood damages is flood proofing. Some buildings could feasibly be permanently flood proofed so that no human action would be required in time of flood; others could be contingently flood proofed only, requiring human action for protection during floods.

More than 500 buildings in Adena and the Dillonvale area (including Newtown and Olszeski Town) would require modifications for flood protection. Scattered residential and commercial buildings north of Adena along North Fork and in other areas would also require flood proofing modifications.

Most buildings subject to maximum flooding require protection to about 4.5 feet or less above the elevation of initial damage. The buildings with the deepest flooding may require structural reinforcement. Others may require additional waterproofing and auxiliary entrances.

The highest flood stages at Adena and Dillonvale are expected to occur in less than 16 hours after storm runoff begins. Some contingent flood proofing devices are not expected to be placed in service and functioning properly during this time. Flood proofing devices are, therefore, estimated to be less than 100 percent effective in preventing flood damages.

Maintenance, including periodic inspection and testing of flood proofing facilities, would be the responsibility of individual property owners.

Initial flood proofing installation costs, including design, administrative and construction costs, are estimated to average $2,890 per building. Maintenance costs and operation costs of installing contingent flood proofing facilities and removing them after floods are expected to average $30 per building annually. The estimated average annual flood proofing cost is $103,740 or an equivalent one-time cost of $1,689,000, using an interest rate of 6 1/8 percent and a project life of 100 years. With accelerated conservation land treatment included, the estimated average annual total project cost is $260,500 or an equivalent one-time cost $4,241,000.

Flood damages to developments other than buildings would not be alleviated with this alternative. Unprotected utilities and transportation facilities would continue to receive damage. Most sediment and erosion damage accompanying flooding would be undiminished.

The stream environment would be undisturbed by this alternative, and the current effects of floods on the environment would be unaltered except for two to three percent reduction due to accelerated conservation land treatment.

The accelerated conservation land treatment program and its effects would be the same as described in Alternative C.

F. ACCELERATED CONSERVATION LAND TREATMENT AND FLOOD INSURANCE

To supplement the flood reduction effects of accelerated conservation land treatment, a flood insurance program could enable all citizens to share the risks of economic losses from flooding. The risks are now borne mainly by flood plain property owners.

The severity of economic impact on individuals from a flood event could be lessened, and the losses could be shared regionally or nationally. Flood insurance users would make premium payments at fixed time intervals in exchange for receiving payments to defray flood losses at irregular intervals. The overall, long term flood-related costs to directly affected individuals would probably be lower than existing flood costs because of governmental subsidies. Other losses such as interrupted transportation service would be unchanged by a flood insurance program.

The total long term costs of flood insurance, including premiums, subsidies, and administrative costs of governmental agencies and private insurance carriers, would be greater than the total reimbursements for flood losses. If residents and owners of commercial establishments in the project area would insure their structures and contents for the expected damages from a 100-year storm, the costs would total an estimated $215,300 yearly. The estimate includes the premium payments of property owners and federal subsidies. With interest at 6 1/8 percent and a project life of 100 years, the equivalent estimated initial cost is $3,507,000. With accelerated conservation land treatment included, estimated total annual project costs are $372,000 or an equivalent capitalized cost at 6 1/8 percent interest of $6,058,000.

The physical environment would be unaltered by flood insurance and flood damages to existing flood plain developments would continue. Legislated flood insurance rules require governmental regulation of flood plain use to help prevent increased future flood damages. This feature would lessen future damages by restricting new buildings and improvements on flood plains. The accelerated conservation land treatment program would lower

flood damages about two or three percent and have the other environmental effects described in Alternative C.

G. ACCELERATED CONSERVATION LAND TREATMENT, EIGHT RESERVOIRS, FLOOD PLAIN USE REGULATION, AND FLOOD PROOFING

This combination of project measures could be used to reduce flood damages while limiting environmental changes. The eight flood control reservoirs and conservation land treatment measures would reduce the number of buildings to be flood-proofed and the depth of flooding. About 350 buildings would require modifications for flood protection, and the maximum flooding depth (except for a few buildings) would be about three feet above the elevation of initial damage.

This alternative would provide about the same protection from floodwater damage to buildings as the proposed project. Reductions of sediment and erosion damages would be less than with the proposed project, and floodwater damages to utilities and transportation facilities would be greater than with the proposed project.

The net changes to the physical environment would be a combination of effects of the accelerated conservation land treatment and the eight reservoirs. The flood proofing installation costs for this alternative are estimated to average $1,880 per building, and the maintenance and operation costs are an estimated $20 per building per year. The estimated total annual costs, including installation, operation, maintenance, and administrative regulation, are $472,700. The equivalent initial cost is $7,697,000 when a 6 1/8 percent interest rate is used with a 100-year project life.

H. ACCELERATED CONSERVATION LAND TREATMENT AND FLOOD PLAIN PURCHASE

Accelerated conservation land treatment could be supplemented by purchasing areas now subject to flood damage and converting them to uses subject to little or no flood damage. Land could be purchased below the elevations of any flood frequency. If only the urban land to be protected by the proposed project were purchased, about 530 residences and about 85 commercial enterprises

would be bought. The total required land purchase would be about 490 acres. If the agricultural land subject to serious and frequent flooding were also purchased, the total urban and agricultural land acquired would be about 640 acres. All the people occupying these residences and commercial enterprises would have to be relocated.

The effects of the accelerated conservation land treatment are discussed in Alternative C.

If roads, railroads and utilities were allowed to remain in flood areas, damages to these facilities would continue at levels nearly as high as at present; if the facilities were removed, transportation and other services for the area would be disrupted. If urban land only were purchased, and roads were not closed, the benefits would be about 85 percent of the benefits for the proposed project; if both urban and agricultural land were bought, and roads were closed, the level of protection would be slightly less than for the proposed project because infrequently flooded agricultural land would not be purchased, and transportation services would be disrupted.

Tax revenues from flood areas would change. The amount of revenue from purchased land would depend on the use made of the land.

The land purchase costs include costs of fee simple titles to areas subject to flooding and to uneconomic land remnants, costs of removing buildings and other developments for safety and aesthetic improvement, administrative costs such as for surveying and legal fees, and costs of relocating displaced persons and businesses. The total one-time cost of purchasing only urban land and relocating people is estimated to be $17,418,000 or an equivalent annual cost, using a 6 1/8 percent interest rate and a 100-year project life, of $1,069,600. The estimated costs for acquiring both urban and agricultural land and relocating urban and rural people are $17,564,000 at one time which is equivalent to $1,078,600 yearly for a 100-year project life. The total cost of the alternative which includes accelerated conservation land treatment is $20,019,000 at one time or $1,229,000 yearly for 100 years.

I. NO PROJECT

The alternative of no project was considered. The problems described in the Water and Related Land Resources section would remain unsolved. Activities such as coal mining, road changes, and local channel changes would change the future environment.

Current land uses in the flood plains are expected to continue without a project. Residential or commercial use of flood plains is not expected to increase appreciably due to flood hazards and trends toward more land use restrictions.

Without the proposed project, an average of $119,732 of net benefits (benefits minus costs) would be foregone annually at 6 1/8 percent interest and a 100-year project life. This is equivalent to a one-time figure of $1,949,700.

V. SHORT-TERM VERSUS LONG-TERM USE OF RESOURCES

Larger job markets in nearby cities and increased surfacemining operations have had a significant effect on land use and water quality in the Short Creek Watershed. From 1964 to 1969, the number of farm operators in Jefferson and Harrison Counties decreased by 24 percent.1/

Land use plans are for developing conservation farming practices such as strip cropping, contour farming, proper hayland renovation and management, as well as construction of farm ponds and wildlife food and cover plantings. Improved forest land management will include tree planting, grazing exclusion, cultural measures, and continuing fire protection. These measures will permit continued use of the land to serve the present generation while preserving it for use by future generations.

The short-term productivity of Short Creek and the adjacent land is currently reduced due to the degraded water quality and the recurring flood hazard. The proposed project would increase the possibilities of enhancing long-term productivity of the stream and adjacent land by increasing the hydraulic efficiency of

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1/ U.S. Department of Commerce, Bureau of Census, 1969 Census of Agriculture, (Washington, D.C., September 1971).

the stream and by reducing flood damages. Related landscaping would, in the eyes of some, enhance the aesthetics of the project area.

The project measures, including flood control, are designed to be fully effective for 100 years. After that, they may continue to provide water and related land resource benefits. However, the long-term productivity of the affected environment will depend to a great degree on adequate water quality, air quality, and land use controls relative to the industrial activity and resource use beyond the scope of this project.

The Short Creek Watershed is located in two water resource planning regions, the Muskingum region and the Upper Ohio region.

The Muskingum water resource region has three watershed projects approved for construction, five watershed projects in the application stage, and one watershed project in the active planning stage.

The Short Creek Watershed is located in the Ohio River Basin water resource region. It comprises approximately .08 percent of the Ohio Basin. The status of the PL-566 watershed program in the region is: 72 watersheds in the application stage; 30 watersheds authorized for planning; 73 watersheds authorized for operation; and 37 watershed projects completed.

The watershed is part of two water resources subareas, the Muskingum subarea and the Pittsburg-Wheeling-Beaver subarea. The Muskingum water resources subarea has one project approved for construction, one authorized for planning, and three in the application stage.

The Pittsburg-Wheeling-Beaver subarea has three completed projects, four approved for operations, one authorized for planning, and two in the application stage.

The completed and authorized watershed projects for the two water resources subareas represent a drainage area of approximately 522,000 acres. Included are 51 structures controlling floodwater and sediment on about

269,000 acres. Through the expected life of these structures over 4,900 acre-feet of sediment will be trapped and stored.

The planned project for the Short Creek Watershed will not conflict with the Ohio River Basin Comprehensive Survey or any other water resource development plan in the area. No adverse cumulative effects are anticipated from installation of the planned project measures.

VI. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The dam, spillway, sediment and detention pools of the reservoir and the channel work will change the land uses either permanently or periodically on a total of 648 acres. This area presently consists of 140 acres of woods and brush, 187 acres of pasture, 130 acres of cropland, and 191 acres of miscellaneous land uses.

Agricultural and wildlife use on 321 acres will be permanently altered by the dam, spillway, and sediment pool. With a 50-year sediment pool of 68 acres, flooding of 208 acres in the detention pool will periodically interrupt use of this area for limited periods. With a 100-year sediment pool of 100 acres, flooding of 176 acres in the detention pool will occur periodically. About 2,800 feet of stream channel will be eventually eliminated by the sediment pool, and about 12,000 feet of stream will be periodically inundated. About 10 miles of stream channel work will permanently alter the use of approximately 109 acres. Also lost will be the recreational potential of the streams in their present state.

Approximately 66,800 cubic yards of riprap to be used for channel stabilization will be irretrievable for the project life, as will 307,000 cubic yards of embankment fill materials.

Certain material and capital expenditures will be irreversibly committed to project purposes during the project life.

VII. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES - AND OTHERS

A. GENERAL

Overall consultation and coordination among local, state, and Federal agencies has been comprehensive during the history of this project development. From 1966 to 1971, meetings of the Local Sponsors and interest groups have been held on a regular basis to arrive at specific project goals and to sustain interest. Four public meetings were held between October 1969 and November 1970 while the work plan was being compiled. During the work plan stage, numerous meetings were held by the Sponsors with local, state or federal agencies or with the general public. All of these meetings concerned project formulation or evaluation of the Sponsors' goals within the project area.

A public meeting was held on October 29, 1969, to explain the draft work plan. All Sponsors and about 20 people from the project site attended. Overall reaction to the proposed work plan was favorable, and no serious or significant objections were made by any individual, group or agency. However, since that time the Harrison County Commissioners on March 27, 1972, filed an objection to the Short Creek Work Plan in which they requested an additional 10,000 feet of channel work be added to the project and that the Fox Bottom flood prevention dam be constructed as a dry dam. Upon completion of the court hearings, this objection was overruled by the Short Creek Conservancy Court.

Project reconnaissance reports by the U.S. Army Corps of Engineers and the Bureau of Sport Fisheries and Wildlife and detailed studies by the Soil Conservation Service were used for project formulation. The specific recommendations and work plan comments by these agencies were discussed with Project Sponsors and incorporated in the final work plan.

An informal field review was held at Adena prior to preparation of the final plan. All concerned local, state, and federal agencies were invited to the meeting and were asked to comment on the work plan. The work

plan and the environmental impact statement have been prepared in consideration of all comments and recommendations provided by the Project Sponsors and state and federal agencies.

The Ohio Historical Society, under contract with the Soil Conservation Service, conducted a reconnaissance survey of the proposed structure sites in the Short Creek Watershed and a literature search of local historical records. This study revealed three sites of archaeological interest in the Fox Bottom reservoir area and one site near Deyarmonville in the area of channel work. However, none of the sites are recommended for nomination to the National Register of Historic Places, nor are any sites in the areas of proposed construction currently listed in the Register.1/

The Society recommended that a more detailed study of these areas be made, therefore, the Soil Conservation Service negotiated another contract with them to do so. The Ohio Historical Society stated that the results of this second study indicated that no areas of historical or archaeological value would be affected by the Short Creek Watershed Project.2/

The following organizations as well as other interested persons will be kept informed on progress of the watershed project:

National Park Service
Chief, Archaeological Research
Northeast Regional Office
143 South Third Street
Philadelphia, Pennsylvania 19106

Ohio Historical Society
17th Avenue and Interstate Rte. 71
Columbus, Ohio 43201

1/ "An Archaeological Survey of the Short Creek Project Area, Harrison and Jefferson Counties, Ohio," by Martha Otto, Ohio Historical Society, Columbus, Ohio, April 2, 1974.

2/ "Archaeological Investigations in the Short Creek Project Area, Harrison and Jefferson Counties, Ohio," by Martha Otto, Ohio Historical Society, Columbus, Ohio, July 9, 1974.

B. DISCUSSION AND DISPOSITION OF EACH COMMENT ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Comments were requested from the following agencies:

Department of the Army
Department of Commerce
Department of Health, Education, and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
Federal Power Commission
Ohio Department of Natural Resources
Ohio Environmental Protection Agency 1/
Office of the Governor (Ohio),
Planning and Development Clearinghouse 2/
Appalachian Regional Commission

Each of the above agencies responded with the exception of the Federal Power Commission. Comments from the Ohio Environmental Protection Agency included consolidated comments on the draft environmental impact statement from:

Ohio Department of Agriculture
Ohio Department of Economic and Community Development
Ohio Department of Natural Resources
Ohio Department of Transportation
Forest Audubon Club of the Ohio Audubon Council
Southeastern Ohio Health Planning Association
Brooke-Hancock-Jefferson Metropolitan Planning Commission 3/
Jefferson County Regional Planning Commission

In addition, comments were also received from the following:

Forest Audubon Club of the Ohio Audubon Council
Brooke-Hancock-Jefferson Metropolitan Planning Commission

1/ Governor's Designated Agency.
2/ State Clearinghouse.
3/ Areawide Clearinghouse.

U.S. Department of the Army

1. Comment: We have reviewed this work plan and foresee no conflict with any project or current proposals of this Department. The draft environmental statement is considered to be generally satisfactory and responsive to the requirements of Public Law 91-190, 91st Congress.

   Response: No response necessary.

2. Comment: Mention that reservoir water quality would be unsuitable for contact recreation (noted in the Work Plan) and that fish habitat would probably, therefore, be of low quality may be appropriate in the discussion of fish habitat.

   Response: Due to poor water quality in the Middle Fork of Short Creek, Sponsors have decided not to have a permanent pool at the Fox Bottom reservoir until the stream's water quality has been upgraded enough, as judged by the Ohio Environmental Protection Agency and the Ohio Department of Natural Resources, Division of Wildlife. This subject is discussed on pages II-17 and II-99.

3. Comment: It is inferred that hunting and fishing opportunities associated with the improvement would not be available to the general public. If this is the case it should be discussed.

   Response: No provisions have been made in the Short Creek Plan for general public access to any of the project's works of improvement. Recreation is not a specific goal of this project due to significant water pollution at the Fox Bottom reservoir site.

   Incidental recreation opportunities resulting from the project and public access in the watershed are discussed on pages II-9, II-63, and II-107.

4. Comment: It is suggested that plans to control vectors in the impoundment area and small ponding areas be included.

Response: No specific plans in this project were developed for controlling vectors. However, project impacts on mosquito production in the watershed are described on page II-98.

U.S. Department of Commerce

1. Comment: The section on Environmental Setting should provide more specific information on the environmental setting, particularly the aquatic habitat and biota. For example, information on water quality and on species of aquatic plants and animals should be tabulated and supported by appropriate documentation.

   Response: More specific information on the plant and animal resources in the watershed has been included on pages II-52 to II-66.

2. Comment: Short Creek is a tributary of the Ohio River. We suggest, therefore, that the impact of the project on that river, including the effect of the project on recruitment to its fish populations, should be discussed in the section of Environmental Impact.

   Response: These impacts have been discussed on page II- 106 in the "Environmental Impact" section.

U.S. Department of Health, Education, and Welfare

1. Comment: The Department of Health, Education and Welfare has reviewed the health aspects of the above project as presented in the documents submitted. This project does not appear to represent a hazard to public health and safety.

   Response: No response necessary.

U.S. Department of the Interior

1. Comment: The proposed channelization of 10 miles of stream will adversely affect the fish habitat in the modified reaches. Further, the removal of streamside cover will destroy songbirds, wood duck and fur-bearer habitat as well as increase stream

temperatures and reduce drift organisms. The towns in the valley will experience aesthetic degradation as channelization will cause the loss of mature trees and other natural values. Moreover, the 62-acre impoundment created by the floodwater retention structures will eliminate 3,350 feet of good quality stream fishery. We also believe the construction and maintenance techniques used to protect plant, fish, and wildlife resources should also be discussed in the work plan rather than in the environmental statement only.

Response: The quality and quantity of aquatic and terrestrial habitats to be affected by project measures have been described on pages II-96 and II-99 in the final statement.

The construction and maintenance techniques used to protect plants and animals are included in the revised plan on pages I-14 and I-26 and in the final statement on pages II-21 to II-28.

The Short Creek Watershed Plan has been revised and updated in accordance with new Soil Conservation Service guidelines to minimize repitition of information in the environmental impact statement published with the plan.

The plan now includes a "Planned Measures" section and extensively revised sections on "Installation Provisions" and "Operation and Maintenance Provisions," as well as updates of costs and benefits. Most of the "Description of Watershed" section of the original plan was not included in the revised plan, since the watershed is described in detail in the environmental impact statement.

2. Comment: The proposed channel work through the Village of Dillonvale will impact on Memorial Park, and the development of this park was funded by a Land and Water Conservation Fund grant (Project 39-00066). Once monies from this fund are committed for the acquisition or development of a recreational area no portion of that property shall be converted to another use without approval of the Secretary of the Interior (see Section 6 (f) of Public Law 88-578, as amended).

Response: The park, located near the end of Main Street, includes a swimming pool, basketball court, swings and other playground equipment. The planned project will not convert park land to another use.

3. Comment: Neither the work plan nor the draft statement identify the amount of park land that will be required for the channel and levee features of this project. While the levee would be constructed on park land, no recreation equipment will require relocation; but these lands will have a lower density recreational use. The levee would provide the park with flood protection, and its value to the park would preclude replacement of park lands upon which the levee is built. In any event, we believe Section 6 (f) of the Land and Water Conservation Fund Act will apply to those park lands used in this project and a temporary conversion (easement) may be possible if assurance were given that the park lands designated for interim use would be restored to preconversion condition. This request for the conversion, with appropriate assurances, should be submitted to our Regional Director, Bureau of Outdoor Recreation, 3853 Research Park Drive, Ann Arbor, Michigan. However, we would defer action on this request until the requirements of the National Environmental Policy Act of 1969 have been satisfied.

   Response: The channel design in the park area has been changed to eliminate the levee. The channel profiles, Appendix E, show the details of the 100-year flood elevations after project installation and the modified depths, bottom widths, and side slopes in the park area.

   Any temporary use of park land for project construction and maintenance will not permanently disrupt park facilities. Requests for temporary use of park land will be made by the Short Creek Watershed Conservancy District in the course of obtaining project land rights.

4. Comment: The work plan describes in some detail the mining operations in the watershed area. There

is bituminous coal mining both by strip and underground methods. A limestone quarry has operated near Cadiz, Harrison County. The plan also estimates the quantity of coal to be lost under the dam and describes borrow areas adjacent to the dam. It mentions 67,000 cubic yards of riprap to be used in the construction but gives no description of the source of this material. Although references to mineral resources are scattered throughout the work plan, rather than confined to one section, the plan adequately discussed this feature of the project. It is believed that the project would have but minor effects on mineral resources.

Response: The source of riprap is usually selected by the construction contractor while the sponsors' or Soil Conservation Service's responsibility regulates only the quality of the riprap. Therefore, the source is not known at this time.

5. Comment: This proposed action will not adversely affect any existing, proposed, or known potential units of the National Park System, or any known historic, natural, or environmental education sites eligible or considered potentially eligible for the National Landmark Programs.

   Response: No response necessary.

6. Comment: For compliance with the Federal Reservoir Salvage Act (PL-86-523), we request the Director, Northeast Region, National Park Service, 143 South Third Street, Philadelphia, Pennsylvania 19106, be kept informed of the progress of this proposal so that necessary archaeological salvage work can be programmed and scheduled for completion prior to project construction and flooding. Should the parties to the Work Plan Agreement desire to initiate early action in response to the Federal Reservoir Salvage Act, the National Park Service can assist in arranging for archaeological work to be undertaken by a cooperating institution on a reimbursable basis.

   Response: The Ohio Historical Society, under contracts with the Soil Conservation Service, has

conducted a preliminary archaeological survey and a more detailed study of specific areas in the Short Creek Watershed. They discovered no sites or areas of significant archaeological or historical value in the project's constructions areas.1/2/ Findings of both investigations are included on pages II-69 in the "Environmental Setting" section.

The Director of the National Park Service in the Northeast Region, the Ohio Historical Society, and other agencies will be kept informed on the progress of this proposal.

7. Comment: This statement does not provide an adequate discussion of the fish and wildlife resources, both in respect to Short Creek Watershed and to its relationship to the Ohio River. Fishery inventories of the project affected areas are missing as is a discussion of the fish habitat and other aquatic organisms. There are no inventories of the wildlife populations, and the habitat is not described with respect to type of quality. The existence of unusual plant species required a more detailed discussion for evaluation purposes.

   Response: Information obtained from biological inventories in the watershed has been included on pages II-52 and II-66 in the "Environmental Setting" section.

8. Comment: We believe the report format is somewhat difficult to follow and offer the following suggestion. We believe the discussion of wildlife mitigation should be deleted from the "Environmental Setting," and suggest that these measures be discussed after the "Environmental Impact" section as the reader can then get a better appreciation of the following section dealing with the "Unavoidable Adverse Effects."

1/ "An Archaeological Survey of the Short Creek Project Area, Harrison and Jefferson Counties, Ohio," by Martha Otto, Ohio Historical Society, Columbus, Ohio, April 2, 1974.

2/ "Archaeological Investigations in the Short Creek Project Area, Harrison and Jefferson Counties, Ohio" by Martha Otto, Ohio Historical Society, Columbus, Ohio, July 19, 1974.

Response: Soil Conservation Service guidelines for the format of environmental impact statements, which have been modified since the draft statement for Short Creek was distributed, now state that mitigation measures are to be described in the "Planned Project" section which has been placed before the "Environmental Setting" and "Environmental Impact" sections. This new format has been used for the final environmental impact statement for the Short Creek Watershed Project.

9. Comment: We noticed a slight discrepancy in the size of the drainage area between the map, figure 5, and the 81,280 acre figure given on page 1. The map shows the drainage area to extend all the way to the Ohio River; and thus, it properly should include the basin of Little Short Creek. If Little Short Creek Basin is included, the drainage area is about 94,720 acres.

Response: The application for planning assistance states that the area consists of 127 square miles or 81,280 acres and comprises the area upstream from the junction of Little Short Creek. Our maps are the result of an apparent misinterpretation of the application.

10. Comment: Mention is made on page 3 of the extensive strip mining activities found in the watershed. The statement indicates that all of the 24,000 disturbed acres have been graded and revegetated with 80 to 90 percent effectiveness. Perhaps the discussion at this point should also address the subject of removal or leveling of the extensive slag dump along the Middle Fork between Newtown and Dillonvale.

Response: Although the removal or leveling of the slag dump in question would be aesthetically pleasing such action surpasses the scope of this project. Scenic enhancement may be accomplished most effectively through local administration and local units of government.

11. Comment: The figure of 18,400 tons of sediment discharge annually into the Ohio River from the

Short Creek Watershed (page 3, third paragraph; page 7, next-to-last paragraph) seems low. During the 1970 and 1971 water years, the U.S. Geological Survey made instantaneous suspended-sediment measurements in Short Creek near Dillonvale. Drainage area above the station, located 2.9 miles upstream from Little Short Creek, is 123 square miles. An average annual discharge of 86,200 tons of suspended sediment was calculated, based on the instantaneous measurements and flow-duration data for the period 1941-67. Moreover, bedload is estimated to be at least 10 percent of the total sediment load and it could run to 20 percent considering the 12 millimeter median diameter of the bed material. Thus, the total annual load at this station could average as high as 95,800 tons.

Response: Recent U.S.G.S. stream gauge data indicates an average annual sediment discharge of 52,600 tons per year 1/ or 408 parts per million, based on instantaneous suspended sediment samplings and flow duration data post-dating receipt of this comment. These new data are incorporated on page II-70 of the statement.

12. Comment: A reach of good quality water exists on the Middle Fork and its tributaries above Adena. This reach is vaguely referred to on page 3 as having poor water quality and a fishery consisting mainly of forage and rough fish. While this may be true of the stream near Cadiz, it is not true further downstream nor is it true of the South Fork of Short Creek. Largemouth bass, smallmouth bass, redhorse suckers, other species of fish and aquatic food organisms which will not tolerate silt, acid water, and domestic wastes exist here. The statement made to the effect that poor water quality limits the fishery to carp, suckers, and catfish should indicate which species of suckers since most species of suckers are intolerant of poor water quality, particularly turbidity.

1/ Received in letter from Peters W. Antilla, Hydrologist, U.S. Department of the Interior, Geological Survey, Water Resources Division, Columbus, Ohio, to Leonard L. Myers, Geologist, Soil Conservation Service, USDA, Columbus, Ohio, dated February 13, 1974.

<u>Response</u>: Information concerning species composition of the fishes in the Short Creek Watershed has been obtained from the Ohio Department of Natural Resources, Division of Wildlife, and has been included on pages II-60 through II-63 in the "Environmental Setting" section.

13. <u>Comment</u>: The fishery discussion could be more detailed and perhaps should include the latest fish inventories conducted by the State. An estimated of fish populations in pounds per acre would add to the discussion. Fish habitat should also be described, since the entire stream is a series of pools and riffles and in many places excellent bank cover exists. Bottom types, which are an important consideration in both existing fish populations and populations of shellfish and other aquatic organisms are lacking and should be described in detail. Many of the smaller tributaries to the Ohio River, such as Short Creek, are important contributor of food organisms and provide critical spawning habitat for sport and commercial fisheries. This value should be discussed.

    <u>Response</u>: Pages II-60 through II-63 of the final statement contain additional information concerning fish populations, water quality, and aquatic habitats, including bottom types, in various sections of Short Creek. Fishery values of Short Creek in relation to the Ohio River are also discussed on page II-60.

14. <u>Comment</u>: The discussion of existing wildlife populations and habitat leaves much to be desired. No indication is given of population densities, habitat quality or diversity of cover types. In fact, some of the valley slopes are vegetated with plant species considered unusual elsewhere in Ohio. Hemlock, Canada yew, mountain laurel and many species of mosses and ferns found only in cold steep unglaciated valley sites exist on the north facing slopes of the Short Creek Watershed.

    <u>Response</u>: Additional information concerning the plant and animal resources in the watershed has been included on pages II-52 to II-66.

15. Comment: The mouth of Short Creek at the Ohio River has a large backwater marsh area which has historic waterfowl and fish reproduction values. This area as it relates to the project is not mentioned and should be described since increased sedimentation from channel activities will affect its quality.

Response: The wetland type values have been described on pages II-46 through II-50 and II-104 through II-106.

16. Comment: The discussion of construction and maintenance techniques provided on pages 5, 6, and 7 and the short table on land use on page 7 should be included under "Environmental Impact" since these items relate to project effects rather than "Environmental Setting."

Response: Construction and maintenance techniques are described on pages II-16 to II-33 in the "Planned Project" section. The table on page 7 of the draft statement has been revised into Tables D and E on pages II-19 and II-22 of the final statement.

17. Comment: Although the draft environmental statement expresses intended compliance with the Federal Reservoir Salvage Act (PL 86-523), the statement should indicate knowledge of whether or not archaeological values are present or absent. Because archaeological values are recognized cultural environmental values, project effects upon such resources, if present, should be discussed in terms of impacts, unavoidable adverse effects, alternatives, short-term productivity, and irretrievable and irreversible commitments. For a detailed environmental analysis, an archaeological survey of the project site is needed to: (1) determine whether or not archaeological values are present and, if so, their significance and extent; (2) provide a basis for an adequate evaluation for environmental statement needs (for consideration in the planning and decision-making processes); and (3) to define any post-authorization salvage program and costs needed to mitigate loss to the archaeological resource base.

Response: We concur with your expressed concern for cultural environmental conservation. The Ohio Historical Society, under contracts with the Soil Conservation Service, has conducted archaeological and historical studies at the proposed construction areas in the Short Creek Watershed. They found no significant archaeological or historic value in these areas, and, therefore, they discussed neither salvage programs nor mitigation costs. 1/ 2/ The results of these studies are described in the "Environmental Setting" section page II-69.

18. Comment: The draft statement indicates that the National Register of Historic Places was consulted. We suggest that the Director of the Ohio Historical Society, who serves as the Ohio State Liaison Officer for Historic Preservation, be consulted to determine whether there are any cultural resources in the project area which may be in the process of nomination to the National Register.

Response: Concur, please refer to the above response to Comment 17. The Ohio Historical Society has stated that there are no cultural resources in the project area significant enough for nomination to the National Register.

19. Comment: Some consideration should be given to the loss of fishery values and fish spawning potential as it related to the Ohio River.

Response: Concur. These points have been explained on page II-101 in the "Environmental Impact" section.

20. Comment: The effects that underground coal mining may have on structures of the project appear to have been adequately considered. Significant adverse environmental impact related to the geology of the area of the project is not anticipated.

1/ "An Archaeological Survey of the Short Creek Project Area, Harrison and Jefferson Counties, Ohio," by Martha Otto, Ohio Historical Society, Columbus, Ohio, April 2, 1974.

2/ "Archaeological Investigation in the Short Creek Project Area, Harrison and Jefferson Counties, Ohio," by Martha Otto, Ohio Historical Society, July 19, 1974.

Response: No response necessary.

21. Comment: In the draft environmental statement, no reference is made to effects on the hydrology downstream from the project area. We suggest some mention of this be included.

    Response: The hydrologic effects downstream from the project area are discussed in the "Environmental Impact" section (page II-109).

22. Comment: On page 8, the statement is made that "normal depths of the stream and its water velocities will be increased." In regard to velocities, this would be true only if the discharge were likewise increased; we suggest this statement be modified.

    Response: Flow depth and velocity increases are explained on pages II-109 and II-110 in the "Environmental Impact" section.

23. Comment: The term "vector control" referred to on pages 8 and 10, probably should be defined.

    Response: Vector control is the control of an animal, such as a mosquito, which transmits a disease producing organism from one host to another.

24. Comment: No mention is made of the possible effects of channel deepening at Adena and Dillonvale on groundwater resources. Some wells at these localities may tap shallow alluvium in the stream channels, and deepening the channels might increase the potential for higher yields by facilitating induced infiltration. On the other hand, deepening the channel might make easier the movement of poor quality water from the stream to nearby wells. The above comments apply also to appropriate parts of the Watershed Work Plan, in addition to these specific comments.

    Response: The municipal water supply at Dillonvale is obtained from wells which tap shallow alluvium of sand and gravel, while Adena no longer relies on

ground water for its supply.1/ The wells at Dillonvale are 30 feet in depth and are less than 200 feet from the stream channel and so could possibly be affected by the proposed channel work. However, the section of channel adjacent to the wells' locations has previously been dredged by local authorities. No resultant change in ground water quality was realized. 2/

25. Comment: Item (h) is not a favorable effect since the 46.8 acres of wildlife cover already exist in one form or another. Its replacement through artificial means will require many years before its value as habitat reaches the value of the existing natural condition. During this time, the replacement habitat will either be valueless or much lower in quality than it is at present.

    Response: The habitat to be destroyed by channel work is generally not of great value to wildlife. This habitat has been described in detail in the "Environmental Setting" section, beginning on page II-50. It will require many years before the trees planted for mitigation reach the size of mature trees to be removed due to the channel work. However, shrubs especially suited to provide wildlife habitat will also be planted for mitigation and these species will provide wildlife food and shelter in four to eight years. Upon reaching maturity, the trees and shrubs planted for mitigation will provide a higher quality habitat than now exists. These woody plants will be selected for compatibility with soil conditions at the planting sites.

26. Comment: Item (j) notes that an improvement in general esthetics will occur. This thought should be clarified to refer only to land treatments since channelization undoubtedly will result in greatly decreased esthetic quality of the watershed. Also, to many people the impoundment will be less esthetically pleasing than the existing natural stream.

1/ Received via telephone from James J. Schmidt, Ohio Department of Natural Resources, Division of Water, March 7, 1974.

2/ From personal interview with Richard Neal, Water Director, Dillonvale, at the Water Works, March 14, 1974.

Response: Concur in part. It is agreed that the general aesthetic quality of the present stream channel will be adversely affected during channel construction. However, since planned mitigation measures include reseeding, and regrading, and tree and tree and shrub reestablishment (which were removed for construction purposes), the general aesthetic quality will be improved. In the eyes of some, any channel work is deleterious to the aesthetics of streams, regardless of the streams' appearance after reestablishment of trees and shrubs. In the eyes of others, a reestablished section of constructed channel is more pleasing than the original condition: the stream is not choked and overgrown with trees and brush, etc. The same opinions apply to the proposed impoundment: some may believe that the stream is aesthetically more pleasing than a floodwater impoundment; others may consider the impoundment to be aesthetically advantageous.

27. Comment: This section (Adverse Environmental Effects Which Cannot Be Avoided) needs to be expanded to include discussions of losses to fishery habitat and potential fishery values of presently degraded streams. Degraded watershed esthetics also should be included since remaining natural values are often in the stream bottoms. This watershed already has received tremendous damage from strip mining in the uplands. More large scale excavation, this time in the valley bottoms, will reduce remaining esthetics values to a minimum.

Response: Information regarding project impacts on fishery habitats and the watershed's aesthetics has been included on pages II-99 to 101, II-103 to 107, and II-113 to 117. Please refer to the response to comment 26.

28. Comment: With respect to the first paragraph, page 11, sediment studies by the U.S. Geological Survey at Short Creek near Dillonvale indicate that bed materials consist of about 19 percent sand. These materials are carried by the flow in suspension about 7 percent of the time. Total discharge, including bedload, of materials of sand size and larger is estimated to be 10,200 tons annually at this station.

Response: Concur. These new data have been included on page II-74 in the "Water and Related Land Resource Problems" section.

29. Comment: The first alternative listed should be expanded to array in greater detail the beneficial and adverse effects for the decision makers. The construction of nine small impoundments would not only be less damaging to the environment, but would also in some cases improve fish and wildlife habitat. The cost for this alternative is approximately the same as the initial cost of the proposed project. A combination of this alternative and alternatives 3, 4, and 5 would probably provide benefits equal to those of the proposed project.

Response: The "Alternatives" section, beginning on page II-118, has been revised and expanded to include additional alternatives and more details about each alternative.

30. Comment: The last paragraph on page 13 and the first full paragraph on page 14 do not relate to the topic and should be deleted.

Response: The subject information, which summarizes the status of other PL-566 watershed projects in the water resource region, has been included in the final statement on page II-128. The Soil Conservation Service's guidelines for the Preparation of Environmental Impact Statements as published in the Federal Register (Vol. 39, No. 107 - June 3, 1974.) requested that this information be included in the statements.

31. Comment: Mention should be made of the length of time needed to produce the trees and other vegetation in the natural areas to be destroyed by structural measures.

Response: This information has been included on page II-103 in the "Environmental Impact" section.

32. Comment: In addition to the other commitments cited, the construction of a dam and inundation of 75.4 acres constitute an irreversible commitment of a relict northern forest plant species site.

Response: The section entitled "Irreversible and Irretrievable Commitments of Resources" (pages II-129) has explained the irreversible commitment of resources which will result from construction of the reservoir. Your comment seems to imply that the reservoir will replace 75.4 acres of "relict northern forest plant species." This is not the case. Results of Soil Conservation Service studies of the plant resources at the reservoir site are included in the "Environmental Setting" section (pages II-52 through II-58). The eastern hemlock was the only species found during these studies which could be classified as a northern forest species. (Hemlocks are abundant in certain parts of Monroe, Hocking, Jackson and other southeastern Ohio counties.) Hemlocks at the reservoir site are located mainly on the cool, shaded hillsides (where anyother northern species could be expected to grow, if in the area) and would receive minimal damage from periodic or intermittent inundation.

33. Comment: The environmental statement discusses mineral resources generally but makes no mention of the loss of the minor coal resources in the area of the floodwater retarding structure. The statement neglects to discuss the impact on the borrow area. Section 7, on page 14, should be revised to include comments on the minor coal resources that would be lost to this project and an estimate of the amount and impact of borrow and riprap.

Response: As stated on page II-18 mineral rights under the dam, spillway, and flood pool area will be purchased by the Sponsors. Neither construction activities nor inundation will affect the coal which lies at a depth of approximately 480 feet. At the termination of the project life, the coal could be recovered if the Sponsors wished to do so. The borrow material and riprap are discussed under "Irreversible and Irretrievable Commitments of Resources," page II-129.

Department of Transportation

1. Comment: The concerned operating administrations and staff of the Department of Transportation have reviewed the statement. The Federal Railroad Administration commented as follows:

   "The Federal Railroad Administration endorses the Short Creek Watershed Project. We assume that the construction design, as in other PL 566 projects where railroads are involved, will be coordinated with the appropriate chief engineering officer where affecting railroad structures is contemplated."

   Response: Appropriate railroad officials will be consulted during design, construction, and maintenance of structural measures.

2. Comment: The Federal Highway Administration commented as follows: "The proposed pool will periodically inundate part of a 3 mile section of Federal-aid Secondary (FAS) Route 1180 in sections 8, 14 15, 21 and 27, T 10 N, R 4 W. The proposed 10 mile stream channel modification appears to be adjacent to portions of FAS Routes 676, 699 and 674 for the remainder of the project.

   "Our major concern is (that) the EIS itself includes little on the proposed roadway. There is also a lack of discussion on the effect on traffic circulation in the counties that would result if the proposed project was implemented.

   "In lieu of the above, we believe the final statement should address itself to the following questions:

   To what extent would the public road system be inundated?

   Response: The Fox Bottom reservoir's flooding of existing County Road 15 and the proposed new state route is discussed on page II-20 in the "Planned Project" section. The reservoir and channel work

will decrease road flooding as indicated in the "Environmental Impact" section, page II-109.

3. Comment: If inundated, what would the need or availability of alternate roadways be?

   Response: The roads, alternate routes, and residents affected are discussed in the "Environmental Impact" section, pages II-108 and II-109.

4. Comment: To what extent will existing roadway embankments and/or stream crossings require reconstruction or improved protection in order to minimize erosion?"

   Response: Channel design for bridges and along roads will protect road facilities and minimize erosion as discussed in the "Planned Project" section, pages II-24 through II-27.

United States Environmental Protection Agency:

1. Comment: Project Measures: The information presently included in this section is inadequate and should include the information on pages 5 to 7. A description of the proposed flood control structure and the dimensions of the modified channel reaches should be included here.

   Response: Information has been rearranged according to new proposed guidelines in the Federal Register (Vol. 39, No. 107 - June 3, 1974). The Fox Bottom floodwater retarding reservoir and the modified channel dimensions are described in the "Planned Project" section, pages II-17 through II-24. Also refer to Appendix E.

2. Comment: With regard to current land use, the 59 percent of "other land" as broken down into 30 percent revegetated surface-mined area, 20 percent idle and 9 percent miscellaneous is vague and needs further clarification (see page 1). What percent of the watershed is currently being mined on the surface? Since mining is a major economic enterprise within the watershed, the EIS should correlate active mining land use to the previous 59 percent figure of "other land."

Response: The term "idle land" generally describes areas which are not utilized for agricultural production. Roads, cultural structures, farmsteads, homesteads, etc., comprise "miscellaneous land."

Since reclamation of surface-mined lands is a continual process, and because some areas on which reclamation measures have been applied are now being re-mined by the larger machinery reaching deeper coal seams, it is difficult to precisely quantify active surface mining and reclamation. About 1500 acres are surface-mined annually in the watershed. Historically, surface mining has periodically disturbed at least 24,000 acres in the Short Creek Watershed. See Figure 3 (page II-41) for the geographic distribution of surface-mined lands in the Short Creek Watershed.

3. Comment: Further description of the mined areas is necessary. Active strip mining land and reclaimed strip mining land should be shown on a map. The character, method, and effectiveness of areas reclaimed and revegetated should be reassessed. The quality of surface runoff from both reclaimed and unreclaimed lands should be a topic of discussion in the EIS. The general location of existing job, refuse and overburden piles along Short Creek and its major tributaries should be mentioned.

Response: Total surface-mined lands in the Short Creek Watershed are delineated in detail on recent aerial photographs in the files of the Soil Conservation Service. A map depicting generalized surface-mined areas (Figure 3) has been included in the "Environmental Setting" section (page II-41) along with a detailed description of specific mined areas.

Responsibility for enforcement of the surface-mined reclamation law lies with the Ohio Department of Natural Resources, Division of Reclamation. However, any critical sediment producing areas, including spoil resulting from surface-mining operations, will be treated according to the Plan.

Surface runoff from unreclaimed surface-mined lands is usually not acid but alkaline due to natural buffering by soluble limestone and limey shale present in the mine spoil. However, such waters are often high in mineral content.

Information concerning the geographic and areal distribution surface-mined lands in the Short Creek Watershed is included on pages II- 40 to 42 in the "Environmental Setting" section.

4. Comment: Our recent field investigation of the project area revealed that the revegetative practices made on the 24,000 acres (or 30 percent) of the watershed disturbed by coal mining operations do not appear to have been as effective as was indicated in the EIS. Even though "all" of this land was supposedly graded and revegetated, we believe land treatment practices have been ineffective because of poor quality soils inhibiting flora growth, overgrazing, improper cultivation and nonconservative farming methods. These practices have contributed to serious sheet and gully erosion along both valley sides of Short Creek. This erosion exposes soil and rock susceptible to oxidation and weathering processes; i.e., acid formation and sedimentation. Since the watershed has an abundance of carbonates in the soil and surface waters, acids are generally neutralized. Uncontrolled sedimentation increases the sediment load to Short Creek and deposition in the channel. The proposed land treatment measures will minimize these problems.

Response: We concur and emphasize that the proposed conservation land treatment measures will minimize these problems and contribute to the project's objectives of reducing runoff, reducing erosion, and improving resource development.

The Ohio Department of Natural Resources, Division of Reclamation, is responsible for regulating reclamation of surface-mined lands.

5. Comment: With regard to flooding, the EIS should provide more detail on past flood occurrences,

their flood frequency and extent of damage. The term, "periodic flooding," on page 2 should be clarified. A complete history of channelization work in this watershed should be included in the EIS with a description on how successful past channelization projects have been in controlling flood damage in this watershed.

Response: The final statement provides greater detail on flood frequencies and damages in the "Water and Related Land Resource Problems" section beginning on page II-73. The periodic flooding of urban areas and roads is also explained. The history of channel work in the watershed is described in the structural measures discussion in the "Planned Project" section, page II-23.

6. Comment: Using the land use percentages: 15 percent cropland, 16 percent grassland, 10 percent woodland and 59 percent other; and the average annual soil loss rates of 7.64 tons/acre on cropland, 2.2 tons/acre on pasture, 2.15 tons/acre on woodland and 1.95 tons/acre on "other land"; it appears that the annual soil loss from the entire watershed is in the order of 230,000 tons/year. How does this figure relate to the figure of 18,400 tons/year as denoted on page 3, paragraph 3? How severe is soil loss from the 24,000 acres of land disturbed by strip mining?

Response: Sheet erosion in the Short Creek Watershed results in an average annual gross erosion soil loss of about 236,000 tons per year ("Gross erosion" refers to the initial average annual displacement of soil by raindrop impact and overland sheet flow; "sediment yield" refers to the average annual delivery of the eroded soil downstream, out of the watershed). The figure for net sediment yield from the watershed, 18,400 tons per year, has been revised to include sediment delivered from all sources, including stream bank and surface-mined areas, comprising an estimated 52,600 tons per year, based on recent U.S.G.S. stream gauge data 1/. Sediment yield represents only a

1/ Received in letter from Peter W. Antilla, Hydrologist, Geological Survey, Water Resources Division, Columbus, Ohio, to Leonard Myers, Geologist, SCS, Columbus, Ohio, dated February 13, 1974.

portion of the total gross erosion on an average annual basis, based upon watershed size and other characteristics.

Approximately 30 percent of the watershed has been disturbed by surface mining. Surface mining for coal is a continual process (as is reclamation), and steep areas with little or no vegetative cover may be temporarily unstable. During the time between the start of mining and reestablishment of protective cover, erosion rates up to 880 tons per acre per year may be realized. However, the average erosion rate for all land that has been surfaced-mined in the Short Creek Watershed is estimated at 2.25 tons per acre per year.

"Other" lands have been separated into "idle," "revegetated surface mine," and "miscellaneous" lands, which experience average annual soil losses of 1.95, 2.25, and 0.95 tons per acre, respectively.

7. Comment: Past water quality data on Short Creek is available from the State's Storet System for monitoring stations located at Cadiz, Adena and Dillonvale. Bottom sediment data should be provided for all areas to be dredged, excavated or channelized. The location of spoil disposal areas should also be noted. The quality of dredge spoil and the location of spoil disposal areas will effect the design of disposal sites and should be determined as soon as possible. All polluted spoil must be confined in such a manner as to not allow any degradation of ground or surface waters.

Response: The Soil Conservation Service has obtained water quality data on Short Creek from the Storet System and this information has been included in the final statement. Channel bottom sediment data gathered for final design may reveal that excavated channel materials will present few contamination problems.

If materials now in the channels do contain undesirable soluble materials, they may currently be degrading the quality of channel and ground waters.

Effective spoil management can reduce contamination potential below levels that may currently exist.

Proposed spoil disposal areas have been located on aerial photomosaics which are available for inspection. Disposal sites include mine waste areas at Adena and near Newtown, and other vacant areas. Contaminated spoil will be placed over the most impervious material available which will be compacted, if necessary, to reduce permeability. Undesirable materials will be covered to minimize water percolation, and finished disposal areas will be seeded to prevent erosion.

8. Comment: The interim water quality management plan for pollution abatement for southeast Ohio tributaries has been tentatively approved but is presently not complete. Specific water quality standards have not been set for this stream because of the proported acid mine drainage problem and the minimum treatment goal that was established for secondary treatment. The EIS should briefly point out the type and adequacy of sewage treatment for each of the communities along Short Creek and its major tributaries. Adena's plant has secondary treatment with chlorination facilities. Currently, chlorination is not being used. Dillonvale presently has primary treatment with no chlorination and will have to upgrade their treatment to secondary. The Deluca Packing Company in Warren Township, Jefferson County is the only large industrial discharger of whom we are aware in this watershed that does not meet the basin guidelines for secondary treatment. This plant discharges to Connorville Creek, a tributary of Short Creek.

   Response: Concur. Information about the sewage treatment plants has been included in the water quality portion of the "Environmental Setting" section, pages II-87 and II- 91 and 92.

9. Comment: With regard to dischargers upstream of the proposed dam, current effluent data from each significant discharger should be obtained and evaluated for the potential long-term effects that

these pollutional sources will have upon the 68-acre pool. The information provided on page 3, paragraph 5 is too general. Cadiz is operating an overloaded secondary treatment plant with post-chlorination that is used only in the summer; this plant frequently discharges to Middle Fork Short Creek at a point of zero low flow. The Cadiz Sewage Treatment Planf will need the best available treatment technology, including appropriate mechanisms for highly efficient BOD, suspended solids and nutrient removals, if a reservoir is to be constructed downstream.

Response: Detailed data on the Cadiz Sewage Treatment Plant's effluent and its effects on the water quality of Middle Fork of Short Creek, where the effluent enters the stream, has been included in the "Water and Related Land Resource Problems" section, page II-87. The pool will remain dry, except during periods of flooding, until the water quality of the stream is improved.

10. Comment: The treatment of wastewater discharged from any water supply facilities in the watershed during filter backwashing operations should also be addressed. Since the groundwaters are fairly hard, we presume that they are still being softened by the lime-soda ash process as they were in 1941.

Response: The municipal water treatment plant at Dillonvale has only chlorination treatment with no filtering systems. Adena's municipal water treatment plant has two filters comprising a lime softening system. Effluent from their filter process will cease when they complete the pipeline being constructed to supply water from outside the watershed. 1/

11. Comment: Despite the fact that water quality data indicates high pH values for Short Creek, occasional

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1/ Information transmitted by telephone from William Roski, Water Superintendent for Adena, on November 8, 1974, and from David Greenwood, Logan District Office of the Ohio Environmental Protection Agency, on November 6, 1974, to Jerry Bernard, Geologist, Soil Conservation Service, Columbus, Ohio.

releases of acid mine wastes may adversely affect aquatic populations. Water quality standards for Short Creek are pending identification of the sources for mine waste drainage and the development of abatement strategies. The Ohio EPA and the Department of Natural Resources should be contacted to provide the following information: the names of coal companies operating impoundments above the proposed reservoir, the purpose of the ponds (i.e. as temporary storage for release during high flow periods and/or treatment lagoons for metal ion precipitation and pH reduction), the frequency and quality of water releases, and if known, the severity of uncontrolled acid mine drainage. The nature of the discharge from area oil wells should also be discussed. This background information is necessary to determine the viability of the proposed reservoir.

Response: The proposed reservoir is found to be necessary for obtaining the designed flood protection of downstream flood plains and their urban areas. This reservoir will remain dry (i.e., no water will be impounded except during periods of flooding) until water in Middle Fork of Short Creek reaches a desirable quality as judged by the Ohio Environmental Protection Agency. The information requested above will be obtained and evaluated before a permanent pool is created.

12. Comment: As early as 1943, there is documentation that Short Creek and streams flowing through Dillonvale were all polluted with mine and human wastes (Ohio DNR, Geology of Water in Ohio, Bulletin 44). Other studies of the Short Creek watershed made in 1966 revealed that the Short Creek Main Stem, South Fork Short Creek, North Fork Short Creek, Perrin Run, Long Run, Piney Fork and Little Short Creek are streams continuously affected by mine drainage; and the Middle Fork Short Creek and upstream portions of Piney Fork are streams intermittently or potentially affected by mine drainage (Report for Development of Water Resources in Appalachia (RDWRA), Appendix C; U.S. Army Corps of Engineers, June 1969). These streams exhibited at that time high concentrations of one or more of the

constituents prevalent in mine drainage (i.e. hardness, sulfate, iron, and manganese) and generally contained alkalinity in excess of acidity near Short Creek's confluence with the Ohio River.

Response: No response necessary.

13. Comment: Water quality data from monitoring stations at Cadiz, Adena, and Dillonvale (during 1970 and 1971) revealed concentrations of sulfate, manganese, zinc, calcium, magnesium, lead, iron, total alkalinity and hardness which get progressively higher farther downstream. Examination of the creek during our inspection showed that the color of the creek became a progressively deeper and darker red-brown going downstream. The reddish hues are probably caused by a combination of iron compounds and humic substances leached from gob piles, overburden, exposed coal and shale strata.

    Response: No response necessary.

14. Comment: Are there any rare or endangered species inhabiting or known to migrate through the area?

    Response: The four rare species and the one peripheral species known to inhabit the watershed are discussed under Plant and Animal Resources in the Environmental Setting on page II-65. No endangered species are known residents of the watershed and no other known rare or endangered species are known to be migratory users of the watershed.

15. Comment: The proposed project is mentioned in RDWRA and was said to be completed by 1980. The report indicated that impoundments for areas off the Ohio River in this reach could be a likely source of additional water supply if significant development would require expansion of existing water supply facilities. The report also indicated that problems have been created with mine drainage entering existing reservoirs in this sector of the Ohio River Basin but did not specifically reference any on Short Creek. However, a number of impoundments do exist in the Short Creek watershed; and it might

be helpful to know the effect that this mining area has had upon the water quality of these impoundments and storage ponds even though they are not necessarily being used for water supply. What is the existing water quality in the impoundments located between Cadiz and Unionvale?

Response: Water quality information about some of the ponds in the watershed is included in Table Q (page II-86). Water Quality in streams and ponds upstream from the proposed reservoir site will be evaluated before allowing a permanent pool to form in the reservoir

16. Comment: In reference to number 8 on page 6, piling spoil in wooded and brushy areas should be avoided unless it fits into the character of the terrain. In all cases, it should be seeded, and if possible sodded, whether it is piled or spread.

    Response: We believe that piling spoil in wooded and brushy areas will cause less overall disturbance to these areas than spreading the spoil. Spreading spoil in these areas would be difficult, if not impossible, without destroying the trees and shrubs where their dense growths will not allow open travel lanes for machinery.

    The piled spoil will be planted with trees and shrubs adapted to the area and especially suited to provide wildlife food and shelter and, in all cases, will be seeded with grasses as soon as possible to prevent erosion.

17. Comment: On page 8, it was stated that project installation will eliminate health hazards associated with flood damage to water supply and waste disposal systems. The EIS should address these health hazard impacts in more detail, i.e. their location, extent and kind of hazards, duration, frequency of occurrence.

    Response: The description of impacts of the proposed project on health hazards has been expanded in the "Environmental Impact" section, page II-112

18. Comment: The states of recreational development in the valley should be mentioned, particularly on reclaimed strip mined land. Ownership of this land should also be addressed. Can any of these programs be related to the proposed project, particularly the strip mined areas on the flood plain?

Response: Recreational resources and problems in the watershed have been described on pages II-66 to 67 and II-79. Land treatment measures planned for this project include construction of farm ponds and increasing wildlife habitat quality in the watershed. These measures will provide more areas for fishing, hunting, birding, nature study, and other recreational activities.

19. Comment: With most of the Middle Fork Short Creek stream flow composed of sewage treatment plant effluent, coal processing waste waters and drainage from strip mines, strip ponds and feedlot areas during low flow periods, water quality will undoubtedly degrade in the 68 acre pool unless action is taken to clean up these and other pollutional sources prior to reservoir filling. In fact, we do not recommend filling of the reservoir pool until these pollutional sources are abated; and assurance is given that water quality in the reservoir pool will not degrade.

Response: Concur. Re-evaluation of the water quality problems in the Middle Fork of Short Creek has resulted in changed plans for the reservoir. The reservoir will not have a permanent pool until water quality in the stream has improved sufficiently as judged by the Ohio Environmental Protection Agency.

20. Comment: The need to rechannelize or merely clear the portion of Short Creek above Adena should be assessed. The flow regime of Short Creek after channelization and dam construction should be described. Pages 24 and 25 of the Work Plan should be included under this section with the discussion of channel modification on page 8 of the EIS.

Response: Clearing and snagging (woody debris removal) are planned for the 1,400 foot Short Creek channel segment in the Adena area downstream from the junction of South and Middle Forks (station 650+00 to station 664+00). Channel enlargement is planned downstream from station 664+00.

Stream flow conditions after project installation are discussed in the "Environmental Impact" section, pages II-101 to 102.

The materials on pages 24 and 25 of the 1971 Work Plan are included in the "Planned Project" section.

21. Comment: We note that poor water quality resulting from influxes of mine drainage and sediment has limited the fishery in Short Creek to carp, suckers and catfish. However, it is proposed to stock the reservoir with bass and bluegills. The U.S. Bureau of Sport Fisheries and Wildlife and the Ohio Department of Natural Resources should be contacted with regard to the tolerance of the fish to be stocked in waters having high pH, total alkalinity, hardness and mineral content. Our preliminary research has revealed the following information:

Zinc concentrations as high as .390 mg/l have been monitored at the Cadiz water sampling station in 1970 and 1971. It is toward fish and aquatic organisms that zinc exhibits its greatest toxicity particularly in soft water. However, in hard water, calcium is antagonistic toward zinc toxicity. It has been reported that for mature fish, the lethal limit in water containing 1.00 mg/l of calcium is only 0.30 mg/l zinc but in water with 50 mg/l of calcium, as much as 2.00 mg/l zinc is not toxic (Water Quality Criteria, State of California Water Quality Board, 1963). With calcium concentrations ranging from 99.2 mg/l to 123.2 mg/l in the past at Cadiz, zinc toxicity should not be a problem to mature fish as long as zinc concentrations have not increased significantly since 1971 and do not accumulate to toxic levels in the impounded area. The potential adverse impacts of zinc accumulating

to toxic levels affecting mature fish and of zinc toxicity to non-mature fish (i.e. fry and fingerlings) and spawning conditions should be addressed. Research conducted for our agency revealed that a zinc concentration of .250 mg/l appears to inhibit spawning in adult bluegills brought into breeding condition in dechlorinated municipal water (containing no added zinc) and to cause complete mortality of bluegill fry. The same water containing only 1/100 or 1/34 of this concentration do not have these effects. (The Use of Fish Movement Patterns to Monitor Zinc, US EPA, December 1971).

According to water samples taken in 1970 and 1971 at the Cadiz station, pH has ranged from 8.40 to 10.0 with a mean of 9.22. This mean exceeds the State's General Water Quality Standards set for aquatic life which is 8.5. The Aquatic Life Advisory Committee of the Ohio River Valley Water Sanitation Commission concluded in the past that direct lethal effects of pH are not produced within a range of 5 to 9.5, but from the standpoint of productivity it is best to maintain the pH in the range of about 6.5 to 8.2 (Water Quality Criteria, 1963).

Response: Concur. Advice from the U.S. Bureau of Sport Fisheries and Wildlife and the Ohio Department of Natural Resources will be sought regarding the tolerance of fish to be stocked to their aquatic conditions. Please refer to response to U.S.E.P.A. comment 19.

22. Comment: The age and quality of any tree lanes or lots which will have to be removed or will be adversely affected by the new hydraulic conditions should be mentioned.

Response: Detailed information regarding the plant resources in the watershed, especially in areas that would be affected by project measures, has been included in the "Environmental Setting" and "Environmental Impact" sections, pages II-52 through 60 and II-103 and II-104.

23. Comment: Impacts of noise and air pollution emanating from construction operations should be addressed. Construction debris and landscape debris should be disposed in a manner other than open burning.

Response: Noise and air pollution impacts resulting from construction operations have been described in the structural measures part of the "Environmental Impact" section, page II-111. All local and state health, air, and water pollution regulations, including burning regulations, will be followed during the installation of this project.

24. Comment: Since wildlife habitat will be reduced by 92.7 acres, this may result in temporary overpopulation of the remaining habitat along Short Creek. Periodic flooding on the 280 acres of the detention pool may prove detrimental to the wildlife habitat development in the island areas.

Response: Page II-100 includes revised figures for the amount of wildlife habitat and other land uses to be disturbed. Whether temporary over population results at certain habitats along Short Creek will depend on the carrying capacities of the habitats, the present species and numbers of animals in these areas, and the species and numbers of animals forced into these areas. If over-populations occur, they are expected to be temporary before disperion into the surrounding areas takes place. Plans for the construction of islands in the reservoir have been cancelled.

25. Comment: The National Flood Insurance Act of 1968 (PL 90-448) authorised the establishment of the Federal Insurance Administration (FIA) under the US Department of Housing and Urban Development. FIA implemented the National Flood Insurance Program which enables persons to purchase insurance against losses resulting from property damage arising from floods or mudslides. The EIS should acknowledge: (1) if Jefferson and Harrison Counties are eligible to receive Federal subsidized flood insurance, and (2) if they have adopted proper

regulations to control and enforce minimum flood-plain use. The key to reducing flood damage and loss of life is compatible land use planning and control, at times coupled with structural flood control measures. Structural measures, when not accompanied by controls over flood plain use have encouraged people to move closer to stream channels and increased the potential for greater property damage.

Response: This information has been included in the "Land Use Plans, Policies, and Controls" section, page II-94.

26. Comment: With regard to the nonstructural alternative of floodplain zoning, the EIS indicated that "zoning would provide no realistic solution. . ." Although this alternative may not be adequate in itself because of existing homes and buildings located in the floodplain, floodplain zoning should not be eliminated from the total plan. In fact, we recommend that a floodplain management plan incorporating compatible land use zoning be developed before project construction. Stricter regulation of the floodplain use is needed than that proposed on page 29 of the Work Plan.

Response: Flood plain land use control is discussed in alternatives D, F, and G of the "Alternatives" section, pages II-120, II-124 and II-125. The "Planned Project" section, page II-11, describes the land use controls planned for the Short Creek Watershed.

27. Comment: Considering present water quality conditions it appears that the proposed wet sediment reservoir could have very little aesthetic or fish and wildlife development potential at this site. Statements regarding the value of such an impoundment should be carefully qualified to indicate the interdependence with an improvement in the use of water and land resources.

Response: Please refer to our response to your comment number 19.

28. Comment: The EIS indicates that channelization may provide different and presumably comparable habitat conditions for fish. Details should be provided to support this view.

Response: Additional information regarding present aquatic conditions in the watershed and the proposed project's impacts on those conditions has been included on pages II-99 to 102.

29. Comment: It is our belief that the adverse environmental effects of channelization far outweigh any possible benefits and that its effects should be viewed as long lasting rather than temporary. Although short-term benefits may be achieved both aesthetically and environmentally from this proposed channelization, it should be realized that when water quality improves, pollution-sensitive organisms would propagate, bio-productivity would increase, and species would become more diversified. Without channelization, stream recovery could be complete in a short period of time. With channelization, stream recovery, even with improved water quality, may never be complete because the stream characteristics have been drastically altered.

Response: Your 12th comment stated that Short Creek was polluted with mine and acid wastes in 1943. Judging from this information and present water pollution in the watershed, there is no way of knowing when the water quality of this area will improve significantly. We do not agree that stream recovery may never be complete due to the channel work, provided the present water pollution in the watershed can eventually be abated. Channel work will increase the stream's recovery time, but land treatment measures and mitigation measures, as described in this environmental statement, will expedite the stream's gradual return to conditions similar to those existing prior to channel work.

30. Comment: Documentation and studies should be provided to support the contention that channelization may provide different and presumably comparable habitat conditions for fish.

Response: This contention was taken out of the environmental impact statement after consultation with the U.S. Environmental Protection Agency.

Ohio Environmental Protection Agency

1. Comment: Conservation land treatment measures are discussed in conjunction with the overall project undertaking in this section of the document. If no federal cost sharing were available, what would occur relative to the number of acres of land treatment measures planned to acres which would actually receive treatment? What impact would this possibility have on the overall project undertaking?

   Response: The land treatment measures shown in Table O, pages II-74 to 75, have been installed on watershed lands during the past 20 years. Some of these received federal cost sharing and some did not. The planned land treatment measures are similar to those in Table O and are planned for accelerated application during a five year period. Without accelerated assistance, the application of these measures would be accomplished in about 10 years. The measures are applied according to a resource conservation plan, are considered to have a favorable benefit-cost relationship, and do not contribute to the project's b:c ratio.

2. Comment: On page 9, several impacts of this project are mentioned briefly. The statement appears that the dam will reduce downstream sedimentation. However, no mention is made that by relieving the water of its load, and by impounding it, the erosive potential is increased. Properly designed spillways or overflow structures can alleviate the problem to a certain degree. Nevertheless, this situation is an impact associated with the project and as such should be identified and remedy measures discussed.

   Response: The erosive potential of the water will not increase by trapping the sediment load. A reduction in silt and clay concentration has little effect on the water's erosive potential in Short

Creek. Laboratory studies have determined that the erosive potential of water begins to decrease only at a suspended sediment concentration higher than about 10,000 parts per million.1/ The maximum daily suspended sediment concentration recorded by the U.S. Geological Survey Stream gauge at Dillonvale for water years 1970, 1971 and 1972 was 3,490 parts per million.2/ The reservoir will decrease sediment transport from the Fox Bottom drainage area but the decrease will not change the stream's existing erosive potential.

3. Comment: Thirty to thirty-five percent of the drainage area is owned by coal companies. The area has been strip mined during the past 25 to 30 years and reclamation has been controlled by the laws in effect at the time of mining. There are still many denuded areas in the Middle Fork drainage basin. With such existing conditions, the projected life of the dam may be shortened. Those barren and easily erodible areas, if adequately reclaimed prior to construction of floodwater retarding structures, would add project life. Strip mining continues in the watershed, however, and many areas previously mined will be stripped again by use of the larger shovels now available to remove more overburden to reach the deeper veins of coal. The 12% reduction in erosion and sediment production appears to refer to that portion of the watershed that borders the channel and other agricultural lands. Amounts for the strip mined areas appear to be omitted.

Response: The Ohio Department of Natural Resources, Division of Reclamation, has the responsibility for enforcing the surface-mine reclamation law after mining is completed. However, early surfacemining

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1/ Simons, D. B.; Richardson, E.V.; and Haushild, W.L.; "Some Effects of Fine Sediment on Flow Pheonomena, US GS Water Supply Paper 1498-G, 1962.

2/ Received in letter from Peter W. Antilla, Hydrologist, Geological Survey, Water Resources Division, Columbus, Ohio, to Leonard Myers, Geologist, Soil Conservation Service, Columbus, Ohio, dated February 13, 1974.

and largely ineffective or nonexistent subsequent reclamation practices have resulted in some areas of high sediment production. These areas will be controlled and treated according to the Plan.

Sediment delivered from the Short Creek Watershed project area to the Ohio River will be reduced from 52,600 tons per year 1/ to 46,300 tons per year, a 12 percent reduction including sediment from surface-mined areas.

4. Comment: The stream fishery is described as limited. Carp, suckers and catfish are listed as the major sport fish identified in the project area. The Ohio Department of Natural Resources, Division of Wildlife has conducted fish management stream surveys which show that largemouth bass, smallmouth bass and rock bass are present in the watershed. These species inhabit the pool and rock bank areas of all major forks of Short Creek. Habitat is found in the areas of good water quality for the most part located in the upper watershed above Adena. The channelization would more than disrupt the aquatic habitat; the ecosystem would be destroyed, showing little or no resemblance to the former stream. Increased turbidity, due to increased velocity, will be detrimental to sport fish as they rely on sight for feeding. Fish cover is important as a means of shelter from current. Removal of cover could be mitigated by the construction of artificial pools and undercut banks which would not disrupt stream flow.

   Response: Additional information on the watershed's fish and wildlife populations and their habitats was obtained from the Ohio Division of Wildlife and included in the final statement along with results of the Soil Conservation Service's biological studies in the watershed. All of this information and details about the planned project were studied carefully to determine the environmental impacts of the project and mitigation measures to be provided.

1/ Ibid.

5. Comment: A statement appears on pages 8 and 9 that the sediment pool would disrupt aquatic vertebrate and invertebrate habitats. However, it is felt that those habitats would be destroyed as lake and river ecosystems are completely different.

   Response: Concur. "Disrupt" has been replaced by "destroyed" in this sentence of the final environmental impact statement.

6. Comment: Clarification is necessary as to the disposition of the existing roadways to be inundated by the pool. Will they be relocated out of the pool, raised above pool elevation or a combination of both? Who will bear the cost of these highway adjustments? Are they included in the project cost?

   Response: These questions are answered in the "Structural Measures" and "Project Costs" parts in the "Planned Project" section, pages II-20, II-24, and II-36.

7. Comment: There should be some discussion pertaining to the prior coordination between SCS and the Ohio Department of Transportation relative to the future location of State Route 150. It should be noted that several alternatives for State Route 150 in the Short Creek Valley were presented and a preferred route was indicated. The discussion should include statements that alternate locations on either side of the pool would encroach on the pool area. However, the small percent storage reduction could be compensated for by slightly modified design of the reservoir structure.

   Response: A discussion of proposed State Route 150 is included on pages II-20 and II-24.

8. Comment: The adverse environmental effects section is severely lacking in content. There is no real attempt to discuss the adverse impacts associated with the project. The ability to adequately address adverse impacts in five one sentence statements is questionable.

Response: The final statement contains more detailed descriptions of the favorable and adverse impacts resulting from the project. The favorable and adverse impacts are described in detail in the "Environmental Impact" section. The two sections that followed in the draft statement (and, under the new guidelines, have been made the last two parts of "Environmental Impact" section) are intended to separate and briefly list the favorable and adverse impacts.

9. Comment: This document fails to adequately assess the potential adverse downstream impacts associated with this project. A brief statement appears in the impact section to the effect that water velocity and duration of flooding downstream will be altered by the reservoir. Downstream impacts associated with the reservoir and the channel modifications should be discussed in detail. Several areas that should be addressed are the possibilities and extent of increased erosion, turbidity and flooding downstream.

   Response: Stream velocities, flood durations, flood flow peaks, erosion potential, and expected turbidity are discussed in the "Environmental Impact" section, pages II-102 and II-110.

10. Comment: One adverse impact not identified is the loss of 244.7 acres of woodland and brush which would be inundated or destroyed. This number per se does not appear to be a significant number of acres. However, when one considers the fact that the watershed is only 10% forested, this figure becomes significant.

   Response: The "Planned Project" and "Environmental Impact" sections contain revised figures of the various land use acreages to be affected by project measures. About 61 acres of the 125 acres of woody vegetation to be inundated or destroyed are located in the detention pool of the reservoir. The frequency with which some or all of these 61 acres are inundated will depend on the water storage needs of the reservoir, but in any event this area will

provide either woody terrestrial habitat or temporary wetland (swamp) habitat. Although temporary flooding will occur in the detention pool, project measures will reduce flooding of woodlands in other areas of Short Creek's flood plain.

11. Comment: A discussion of water quality parameters is lacking in this document. Some mention is made of high readings for sulfates, iron, manganese, aluminum, conductivity and hardness. How high are these values, when were the readings taken and what are the average values for these parameters? Do the same high readings persist throughout the year or only during low flow periods? The document fails to adequately assess the dissolved oxygen concentrations in the streams to be channelized. Specifically, what effect will the project have on dissolved oxygen concentrations? Water temperature, flow rates and assimilative capacity (as it relates to sewage treatment plants) are either poorly discussed or not considered at all in this Environmental Impact Statement.

    Response: Water quality data collected in the watershed by the U.S. Geological Survey, Ohio Department of Health, Cadiz Sewage Treatment Plant employees, Nalin Laboratories (Columbus, Ohio), and the Soil Conservation Service have been included in the "Water and Related Land Resource Problems" section, pages II-84 to II-91. Project impacts on water quality have been described in the "Environmental Impact" section, page II-97.

12. Comment: One benefit of the implementation of this proposal is protection for water and sewage treatment plants. The exact number of such plants in existence in the project area should have been discussed. Relative to sewage treatment plants, the natural recovery of a stream is an important point to consider, especially in terms of allowable loadings (BOD) that can be discharged and still allow water quality standards to be met. Channelization could impact the assimilative capacity of the channelized portion of the stream. Channelization may also move the sag point downstream possibly to an undesirable portion of the stream (i.e.,

at the outfall of another sewage treatment plant). Such potentially negative impacts should be addressed.

Response: Pages II-87, II-91, II-92, and II-102 include information about the sewage treatment plants in the watershed and the quality of Short Creek after channel work has been completed.

13. Comment: Specific information relative to the proposed reservoir is basically confined to sediment pool acreage and acreage occupied by structural elements. What is the projected mean depth of the reservoir? The water flowing into the proposed reservoir is poor quality sediment loaded water from the Cadiz sewage treatment plant, the Georgetown Coal Processing Plant and strip mine areas. At times, the Cadiz plant is reported to provide 50% of the flow rate in the Middle Fork of Short Creek. There are several adverse impacts associated with this situation. Will this reservoir become eutrophic at its outset? Are algal problems anticipated? Will various draw down levels be provided? How safe will the reservoir be for recreational use? How will sport fish with which the reservoir is to be stocked survive the conditions discussed above? Furthermore, what is the anticipated water quality discharge from the reservoir in terms of dissolved oxygen, temperatures and some critical nutrients such as phosphates and nitrates? What is the projected discharge rate of the reservoir and is low flow augmentation designed for the reservoir?

    Response: Re-evaluation of the water quality problems in the Middle Fork of Short Creek has resulted in changed plans for the reservoir. The reservoir will not have a permanent pool until water quality in the Middle Fork has improved sufficiently as judged by the Ohio Environmental Protection Agency.

14. Comment: Disposition of the spoil dredged from the river channel should have been discussed at greater length. Specifically, what criteria will be used to determine whether the dredged material is polluted? Some indication should appear as to

the volume of polluted material that will need special disposition. What burial areas exist for disposition of the polluted dredge material? Will such areas prevent leachate from entering the groundwater? If the polluted material is to be piled in the floodplain, what measures will be employed to preclude its reintroduction into the watercourse?

Response: No criteria have been adopted for determining what part of the excavated material is polluted; this will be done during final design.

The material to be removed from existing channel banks is not considered to be polluted. Some or all of the material to be removed from existing channel bottoms may be determined to be polluted. The volume to be excavated from channel bottoms is about 120,000 cubic yards or about 12 percent of the total excavation. The estimated amount of polluted material thus varies from zero to 12 percent.

Disposition of any materials which may be classed as polluted is discussed in the "Planned Project" section, page II-24. Spoil disposal areas are shown on maps which are part of the supporting material for the Short Creek Plan. The maps are available for inspection. Please refer to page II-154, response to U.S.E.P.A. comment 7.

15. Comment: The "Alternatives" section is severely lacking in data. An actual comparison of alternatives is very difficult. For example, no detailed discussion appears for the nine reservoir sites that were evaluated. What was the nature of those reservoirs and what degree of flood reduction would they provide? How were the costs associated with floodproofing determined? Were those costs evaluated from the standpoint of employing flood insurance to undertake the floodproofing? The alternative of channelization alone as proposed by the Corps appears to be less costly and less disruptive. What parameters were used to determine the increased sedimentation downstream? Could that approach coupled with land treatment measures decrease the downstream sedimentation problems? Finally, costs are given for all alternatives except

the alternative being discussed in this proposal. What is the cost of this project?

Response: The "Alternatives" section has been rewritten and expanded.

The reservoirs are single-purpose floodwater retarding facilities with earthen embankments. The degree of flood protection is discussed in Alternative A, page II-118.

Flood-proofing cost estimates were prepared, by considering such parameters as depth of flooding, number and nature of buildings to be protected, and installation and removal of flood-proofing devices. Flood insurance and flood-proofing costs were estimated separately. The advantages of flood plain land use control associated with flood insurance are recognized in the discussion of the flood insurance alternative, page II-124.

Increases or decreases in downstream sedimentation with various alternative projects are estimated using the following parameters: (1) expected future land use and treatment with and without the alternative project; (2) project structural measures designed to affect sediment movement, such as reservoirs and debris basins with storage reserved for sediment; (3) the expected functional effectiveness of structural measures such as channels designed for limited sediment transport; and (4) the expected effectiveness of the operation and maintenance program.

The comment in the draft statement concerning increased sediment for the project studied by the Army Corps of Engineers was meant to compare sedimentation associated with that project to sedimentation with the proposed P.L. 566 project which includes accelerated conservation land treatment measures and a reservoir. Sedimentation downstream would be greater with the Army Corps of Engineers' project than with the selected project. Accelerated conservation land treatment, coupled with the Army Corps of Engineers' proposal, could decrease the

downstream sedimentation compared with the expected sedimentation with no project.

Costs of the proposed project, including installation, operation and maintenance, are shown in the "Planned Project" section, pages II-33 to II-37.

16. <u>Comment</u>: One alternative not adequately explored is that of obtaining flood insurance eligibility to protect existing structures and residents affected by flood damage and adopting flood plain zoning to prevent further development in the flood hazard areas, thereby, preventing further flood damage. Could this alternative coupled with installation of proposed conservation land treatments mitigate most of the problems in the project area? Would these two approaches and construction of some number of reservoirs be desirable and effective?

<u>Response</u>: Discussions of a flood insurance alternative and a flood plain land use control alternative have been included in the final statement. Alternative G (page II-125) is a project combining reservoirs, conservation land treatment measures, flood plain use regulation, and flood-proofing. The expected effects of this alternative are included in the discussion.

17. <u>Comment</u>: Channel modification is a short-term approach. Long-term productivity will depend upon conservation practices actually applied to the land. In addition, it is strongly recommended that the two municipalities adopt flood plain zoning regulations to preclude future flooding problems within the flood hazard areas. Discussion should occur relative to regulating the land below the reservoir so as to preclude development in what might be considered, at least short-term, as a protected area.

<u>Response</u>: Plans regulating flood plain land use are discussed in the "Planned Project" section, page II-11. The area below the Fox Bottom reservoir is included in the area of planned regulation.

18. Comment: In addition, discussion should appear that details conservation and implementation schedules to insure the long-term productivity in the watershed. The vegetative strips are an important step toward maintenance and enhancement of long-term productivity. However, maintenance may be problematic. Who will enforce the prohibition on mowing prior to July 1? What agency will insure that no farming occurs on those vegetative strips? This land treatment program can only succeed with full cooperation and participation of land owners in the watershed. Will regular inspections be made and appropriate action be taken against violators?

    Response: The Short Creek Watershed Conservancy District will enforce prohibition of mowing of vegetative strips prior to July 1. The same agency will enforce nonfarming of these areas. Annual operation and maintenance inspections will be made to comply with the Operation and Maintenance Agreement signed by the Soil Conservation Service and The Short Creek Watershed Conservancy District.

19. Comment: As agriculture, forestry and wildlife will be permanently altered at the dam site, sediment and detention pools, these situations should be discussed as an irretrievable commitment of resources.

    Response: Concur. These situations have been discussed in the "Irreversible and Irretrievable Commitments of Resources" section, pages II-129.

20. Comment: There is a general lack of supportive data in evidence in this document. Some essential data is missing altogether. Although the major problem in the watershed is identified as flooding, no flood frequency data is presented. In addition, flood levels are not identified. Flooding is said to cause millions of dollars in damage. Figures to detail damages should be provided. Furthermore, actual cost of the project is not given. How was the benefit-cost ratio determined?

Response: Flood frequency and damage data are presented in the "Water and Related Land Resource Problems" section, pages II-73 and II-76. The 100-year flood levels are shown on the profiles, Appendix E, and the depth of flooding at the average low ground is indicated. Estimated costs of the planned project are detailed in this section. The benefit-cost ratio is obtained by dividing the estimated average annual project benefits of structural measures, by the estimated average annual project cost of structural measures. The conservation land treatment costs and benefits are not included in the ratio.

21. Comment: The last paragraph on page 4 of the document needs clarification. The Ohio Department of Natural Resources, Division of Forests and Preserves, indicates that they have no project within the watershed. The Jefferson and Harrison Reclamation Areas operated by that Division are not within the boundaries of the watershed.

Response: Page II-67 of the "Environmental Setting" section clarifies the location of the reclaimed surface-mined area (outside of the watershed, about 5 miles north of Cadiz) being developed for recreation by the Ohio Division of Forests and Preserves.

22. Comment: The game benefits associated with the reservoir are questionable. Constructing islands in shallow portions of impoundments is a good wildlife management practice. However, in this case the islands proposed are in the sediment pool and no mention made of their height. Inasmuch as wildlife reproduction (and specifically waterfowl nesting) begins in mid-March or before, this could be early enough to occur in a high risk period of spring floods. It would seem that low nesting islands in the sediment pool of a flood control reservoir might be detrimental to wildlife reproduction. Furthermore, this part of the State is lacking in waterfowl other than woodduck. There is little use by migrating waterfowl except during periods of such severe weather that migration is interrupted. The islands should be built to as high

a level as possible, and that a minimal amount of clearing be done particularly around the shore of the permanent pool and the end where the islands will be located. This would be a significant improvement in habitat for woodduck and would benefit several furbearers and song birds even if trees were destroyed by high water levels.

Response: Concur. It has been decided that islands will not be constructed in the reservoir.

The Appalachian Regional Commission

1. Comment: Sedimentation at the Ohio River is reduced by only 1,225 tons per year, a reduction of only 12 percent. This appears to be a very slight reduction. To what extent can more extensive land treatment measures improve the level of sedimentation reduction? To what extent is the level of sedimentation related to farming operations, as opposed to stream bed erosion, etc.?

   Response: Conservation land treatment measures will reduce erosion and subsequent sediment production by 1,225 tons per year on an average annual basis. The quantity of suspended sediment reaching the Ohio River from the Short Creek Watershed will be reduced from 52,600 tons per year 1/ to 46,300 tons per year, an annual decrease of 6,300 tons per year or 12 percent.

   Sediment yield is only a portion of the total erosion, and increases in land treatment measures would effect greater reductions in total erosion. A brief discussion concerning the limitations of land treatment only as a project alternative is included in the "Alternatives" section of the final statement, pages II-118 to 119.

   Sediment yield is directly related to the proximity of the tranporting medium (water). For example, streambank sediment yield (as a percent of total streambank erosion) is relatively high compared with the relatively lower sediment yields from farmland erosion.

1/ Ibid.

2. Comment: The statement and Plan allude to the presence of strip and other mining operations and the significant level of land restoration, but there is no discussion of the level of environmental degradation still attributable to mining and treatment measures needed (if any) to reduce siltation and improve water quality.

   Response: The Ohio Department of Natural Resources, Division of Reclamation, has the responsibility for enforcing the surface mine reclamation law after surface mining is finished. However, the Short Creek Plan provides that any identified critical sediment-producing areas, including spoil resulting from surface mining operations, will be treated.

3. Comment: We would strongly suggest (in spite of the level of development, especially urban, in the watershed) that zoning or other developmental controls be initiated. Obviously, such controls do little to protect existing investments, but they would provide needed power to restrict future flood plain development, even though only one or two homes or businesses might be affected. Additionally, controls and other measures could assist in qualifying municipalities for Federal Flood Insurance.

   Response: We have used every available opportunity to stress control of flood plain development in the project area. The 100-year flood line with and without the project has been delineated on recent aerial photographs of the flood plain in urban areas. In addition, an agreement has been secured from the sponsors to do everything within their powers to limit any construction inside the boundaries of the 100-year flood.

Ohio Audubon Council and National Audubon Society

1. Comment: To most of the area affected by the channelization, it will be an improvement. The dam and pool will be of some benefit, providing that farm animal and human waste can be prevented from accumulating and forming a large cesspool.

Response: Favorable and adverse impacts of the project are discussed on pages II-95 through II-117.

2. Comment: Any adverse environmental effects which cannot be avoided should the proposal be implemented. A few places would have water near them and would need access roads to get in and out during floods. Some sections of road must be re-routed.

Response: Road changes accompanying the project are discussed on pages II-20, II-108, and II-109 of the final statement.

3. Comment: Alternatives to the proposed action. Move off the flood plain and let nature take its course. That, of course, would be too expensive and out of the question.

Response: Alternatives to the planned project are described on pages II-118 through II-129.

4. Comment: The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. A small area of the total watershed will actually be taken out of production. The short term use of this area seems to be from flood to flood, the relationship between this and long-term productivity, would be peace of mind. This might lead to a laxness of attitude that might prove disasterous in time of a big flood.

Response: Short-term verses long-term use of resources has been explained on pages II-127 to II-129.

5. Comment: Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. I do not know of any.

Response: This topic has been discussed on page II-129.

6. Comment: If this project is implemented, steps should be taken to guard against any more development on the flood plain that might at sometime in the future prove much more costly and perhaps disasterous.

   Response: Provisions for flood plain management are described on page II-11 in the "Planned Project" section.

Brooke-Hancock-Jefferson Metropoliton Planning Commission

1. Comment: The draft statement appears to present very fairly the prevailing environmental situation and the probable changes involved through the implementation of this project.

   Response: No response necessary.

2. Comment: We urge the SCS to budget sufficient funds in their project design to employ impartial, full-time monitoring inspectors to assure the use of the techniques listed on pages 5 and 6.

   Response: This suggestion will receive full consideration and will be implemented as priorities and budgets permit.

3. Comment: During the meeting of Conservancy District Directors and project sponsors on March 8, 1973, in Sreubenville, the alternative of constructing the Fox Bottom Reservoir as a dry flood retarding structure initially and later creating the 68-acre permanent pool was discussed. If this alternative is still a possibility, the SCS should include its probable effects in the Final Environmentam Impact Statement.

   Response: The temporarily dry sediment pool is described in the "Planned Project" section of the final statement. Its probable effects are discussed in the "Environmental Impact" section.

VIII LIST OF APPENDICES

Approved by Robert E. Quilliam Date APR 30 1976
Robert E. Quilliam
State Conservationist

APPENDIX A

Comparison of Benefits and Costs for Structural Measures

Appendix A

Comparison of Benefits and Costs for Structural Measures
Short Creek Watershed, Ohio
(Dollars)

Evaluation Unit	Average Annual Benefits 1/				Average 2/ Annual Cost	Benefit Cost Ratio
	Damage Reduction	Redevelopment	Secondary	Total		
Short Creek Watershed	335,697	69,293	28,864	433,854	280,760	1.5
Project Administration					42,160	
Grand Total	335,697 3/	69,293	28,864	433,854	322,920	1.3

1/ Price Base 1975 for all benefits except crop and pasture and other agricultural benefits which are adjusted normalized.

2/ From Table 4.

3/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $8,798 annually.

March 1976

APPENDIX B

Project Map

LOCATION MAP
OHIO
LEGEND
Roads
Railroads
Utilities (Power Lines & Gas Lines)
Small Villages
Streams (Major & Minor)
County Lines
Township Boundaries
Lakes
Section Lines & Numbers
Watershed Boundaries
Drainage area controlled by structure
Area benefited
Drainage area in square miles
D. A. 23.02 sq mi
PROJECT MEASURE
Floodwater retarding structure
Stream channel modification for flood prevention.
81° 00' 00"
80° 52' 30"
80° 45' 00"
40° 15' 00"
Hopedale
WAYNE
GREEN
CADIZ
Cadiz
ATHENS
SHORT CREEK
SMITHFIELD
MOUNT PLEASANT
WARREN
HARRISON CO.
JEFFERSON CO.
23.02 Sq mi
Kenwood
Hurford
Georgetown
Harrisville
Adeno
Newell
Piney Fork
Smithfield
Newtown
Dillonvale
Long Run
Mt. Pleasant
Cannarville
Warrenton
OHIO RIVER
Middle Fork Short Creek
Short Creek
South Fork Short Creek
Dry Fork
Piney Fork
Little Piney Fork
Thompson Run
Henderson Run
Cabbage Run
Perrin Run
Goose Run
Harold Run
Rose Valley
Harmon Creek
North Fork
NORFOLK AND WESTERN
CENTRAL
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
APPENDIX B
PROJECT MAP
SHORT CREEK WATERSHED
JEFFERSON AND HARRISON COUNTIES
OHIO
SCALE 1/90,000
5000 0 2500 5000 10000 FEET
1" = 7 500'
Map prepared using U. S. G. S. Topo sheets (1:24,000)
81° 0'00"
80° 52' 30"
REV. 2-15-74
5,0-32,936
USDA-SCS-LINCOLN, NEBR 1974

APPENDIX C

Letters of Comment Received on the Draft Environmental Impact Statement

MAY 9 1973 R. E. Quilliam, SCS, Columbus, Ohio ✓

DEPARTMENT OF THE ARMY
OFFICE OF THE UNDER SECRETARY
WASHINGTON, D.C. 20310

Copies given to Clegg + Bill Wehr

2 MAY 1973

Honorable Thomas K. Cowden
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Dr. Cowden:

In compliance with the provisions of Section 5 of Public Law 566, 83d Congress, the Administrator of the Soil Conservation Service, by letter dated 6 February 1973, requested the views of the Secretary of the Army on the work plan for Short Creek Watershed, Harrison and Jefferson Counties, Ohio.

We have reviewed this work plan and foresee no conflict with any projects or current proposals of this Department. The draft environmental statement is considered to be generally satisfactory and responsive to the requirements of Public Law 91-190, 91st Congress.

Several minor comments, for your consideration, are provided on an attached sheet.

Sincerely,

Charles R. Ford
for Kenneth E. BeLieu
Under Secretary of the Army

1 Incl (dupl)
As stated

RECEIVED MAIL
1973 MAY -7
SOIL CONSERVATION
WASHINGTON

Work Plan and Draft EIS, Short Creek Watershed, Ohio
Minor Review Comments

1. Work Plan. The Adena and Dillonvale local protection projects were authorized by the Flood Control Act of 22 December 1944 but are presently classified inactive due to local interests inability to finance required items of cooperation. It is suggested they be included in the "Projects of Other Agencies" section of the Work Plan since they are discussed in the Draft EIS on page 12.

2. Draft EIS.

a. Mention that reservoir water quality would be unsuitable for contact recreation (noted in the Work Plan) and that fish habitat would probably therefore be of low quality may be appropriate in the discussion of fish habitat.

b. It is inferred that hunting and fishing opportunities associated with the improvement would not be available to the general public. If this is the case it should be discussed.

c. It is suggested that plans to control vectors in the impoundment area and small ponding areas be included.

p.c. Clegg APR - 6 1973

R. E. ~~Quilliam~~, SCS, Columbus, Ohio

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

Shaw

April 2, 1973

RECEIVED MAIL ROOM
1973 APR -5 PM 3:09
SOIL CONSERVATION SERVICE
WASHINGTON, D.C.

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
U.S. Department of Agriculture
Washington, D.C. 20250

Dear Mr. Grant:

The draft environmental impact statement for the Short Creek Watershed Project, Ohio, which accompanied your letter of February 6, 1973, has been received by the Department of Commerce for review and comment.

The Department of Commerce has reviewed the draft environmental statement and has the following comments to offer for your consideration.

The section on Environmental Setting should provide more specific information on the environmental setting, particularly the aquatic habitat and biota. For example, information on water quality and on species of aquatic plants and animals should be tabulated and supported by appropriate documentation.

Short Creek is a tributary of the Ohio River. We suggest, therefore, that the impact of the project on that river, including the effect of the project on recruitment to its fish populations, should be discussed in the section on Environmental Impact.

We hope these comments will be of assistance to you in the preparation of the final statement.

Sincerely,

Sidney R. Galler

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

1 Clegg,
1 Wehst

R. E. Quilliam, SCS, Columbus, Ohio ✓ ~~Quilliam~~ ~~Shaw~~ file

JUN 11 1973

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

RECEIVED MAIL ROOM
1973 JUN -7 PM 12:53
SOIL CONSERVATION SERV.
WASHINGTON, D.C.

ER-73/203

JUN 1 1973

Dear Mr. Grant:

This is in reply to your letter of February 6, 1973, requesting our views and comments on a work plan and draft environmental statement for the Short Creek Watershed, Harrison and Jefferson Counties, Ohio.

The proposed channelization of 10 miles of stream will adversely affect the fish habitat in the modified reaches. Further, the removal of streamside cover will destroy songbird, wood duck, and fur-bearer habitat as well as increase stream temperatures and reduce drift organisms. The towns in the valley will experience esthetic degradation as channelization will cause the loss of mature trees and other natural values. Moreover, the 62-acre impoundment created by the floodwater retention structure will eliminate 3,350 feet of good quality stream fishery. We also believe the construction and maintenance techniques used to protect plant, fish, and wildlife resources should also be discussed in the work plan rather than in the environmental statement only.

The proposed channel work through the Village of Dillonvale will impact on Memorial Park, and the development of this park was funded by a Land and Water Conservation Fund grant (Project 39-00066). Once monies from this fund are committed for the acquisition or development of a recreational area, no portion of that property shall be converted to another use without approval of the Secretary of the Interior (see Section 6(f) of Public Law 88-578, as amended).

Neither the work plan nor the draft statement identify the amount of park land that will be required for the channel and levee features of this project. While the levee would be constructed on park land, no recreation equipment will require relocation; but these lands will have a lower density recreational use. The levee would provide the park with flood protection, and its value to the park would preclude replacement of park lands upon which the levee is built. In any event,

we believe Section 6(f) of the Land and Water Conservation Fund Act will apply to those park lands used in this project and a temporary conversion (easement) may be possible if assurances were given that the park lands designated for interim use would be restored to preconversion condition. This request for the conversion, with appropriate assurances, should be submitted to our Regional Director, Bureau of Outdoor Recreation, 3853 Research Park Drive, Ann Arbor, Michigan. However, we would defer action on this request until the requirements of the National Environmental Policy Act of 1969 have been satisfied.

The work plan describes in some detail the mining operations in the watershed area. There is bituminous coal mining both by strip and underground methods. A limestone quarry has operated near Cadiz, Harrison County. The plan also estimates the quantity of coal to be lost under the dam and describes borrow areas adjacent to the dam. It mentions 67,000 cubic yards of riprap to be used in the construction but gives no description of the source of this material. Although references to mineral resources are scattered throughout the work plan, rather than confined to one section, the plan adequately discusses this feature of the project. It is believed that the project would have but minor effects on mineral resources.

This proposed action will not adversely affect any existing, proposed, or known potential units of the National Park System, or any known historic, natural, or environmental education sites eligible or considered potentially eligible for the National Landmark Programs.

For compliance with the Federal Reservoir Salvage Act (P.L. 86-523), we request the Director, Northeast Region, National Park Service, 143 South Third Street, Philadelphia, Pennsylvania 19106, be kept informed of the progress of this proposal so that necessary archeological salvage work can be programmed and scheduled for completion prior to project construction and flooding. Should the parties to the Work Plan Agreement desire to initiate early action in response to the Federal Reservoir Salvage Act, the National Park Service can assist in arranging for archeological work to be undertaken by a cooperating institution on a reimbursable basis.

We have reviewed the draft environmental statement and submit the following comments for your consideration and use in preparing the final statement.

General Comments

This statement does not provide an adequate discussion on the fish and wildlife resources, both in respect to Short Creek Watershed and to its relationship to the Ohio River. Fishery inventories of the project affected areas are missing as is a discussion of the fish habitat and other aquatic organisms. There are no inventories of the wildlife populations, and the habitat is not described with respect to type or quality. The existence of unusual plant species requires a more detailed discussion for evaluation purposes.

We believe the report format is somewhat difficult to follow and offer the following suggestion. We believe the discussion on wildlife mitigation should be deleted from the "Environmental Setting," and suggest that these measures be discussed after the "Environmental Impact" section as the reader can then get a better appreciation of the following section dealing with the "Unavoidable Adverse Effects."

Environmental Setting

We noticed a slight discrepancy in the size of the drainage area between the map, figure 5, and the 81,280-acre figure given on page 1. The map shows the drainage area to extend all the way to the Ohio River; and thus, it properly should include the basin of Little Short Creek. If Little Short Creek basin is included, the drainage area is about 94,720 acres.

Mention is made on page 3 of the extensive strip mining activities found in the watershed. The statement indicates that all of the 24,000 disturbed acres have been graded and revegetated with 80 to 90 percent effectiveness. Perhaps the discussion at this point should also address the subject of removal or leveling of the extensive slag dump along the Middle Fork between Newtown and Dillonvale.

The figure of 18,400 tons of sediment discharged annually into the Ohio River from the Short Creek Watershed (page 3, third paragraph; page 7, next-to-last paragraph) seems low. During the 1970 and 1971 water years, the U.S. Geological Survey made instantaneous suspended-sediment measurements in Short Creek near Dillonvale. Drainage area above the station, located 2.9 miles upstream from Little Short Creek, is 123 square miles. An average annual discharge of 86,200 tons of suspended sediment was calculated, based on the instantaneous measurements and flow-duration data for the period 1941-67. Moreover, bedload is estimated to be at least 10 percent of the total sediment load and it could run to 20 percent considering the 12 millimeter median diameter of the bed material. Thus, the total annual load at this station could average as high as 95,800 tons.

A reach of good quality water exists on the Middle Fork and its tributaries above Adena. This reach is vaguely referred to on page 3 as having poor water quality and a fishery consisting mainly of forage and rough fish. While this may be true of the stream near Cadiz, it is not true further downstream nor is it true of the South Fork of Short Creek. Largemouth bass, smallmouth bass, redhorse suckers, other species of fish and aquatic food organisms which will not tolerate silt, acid water, and domestic wastes exist here. The statement made to the effect that poor water quality limits the fishery to carp, suckers, and catfish should indicate which species of suckers since most species of suckers are intolerant of poor water quality, particularly turbidity.

The fishery discussion could be more detailed and perhaps should include the latest fish inventories conducted by the State. An estimate of fish populations in pounds per acre would add to the discussion. Fish habitat should also be described, since the entire stream is a series of pools and riffles and in many places excellent bank cover exists. Bottom types, which are an important consideration in both existing fish populations and populations of shellfish and other aquatic organisms are lacking and should be described in detail. Many of the smaller tributaries to the Ohio River, such as Short Creek, are important contributors of food organisms and provide critical spawning habitat for sport and commercial fisheries. This value should be discussed.

The discussion of existing wildlife populations and habitat leaves much to be desired. No indication is given of population densities, habitat quality or diversity of cover types. In fact, some of the valley slopes are vegetated with plant species considered unusual elsewhere in Ohio. Hemlock, Canada yew, mountain laurel and many species of mosses and ferns found only on cold steep unglaciated valley sites exist on the north facing slopes of the Short Creek Watershed.

The mouth of Short Creek at the Ohio River has a large backwater marsh area which has historic waterfowl and fish reproduction values. This area as it relates to the project is not mentioned and should be described since increased sedimentation from channel activities will affect its quality.

The discussion of construction and maintenance techniques provided on pages 5, 6, and 7 and the short table on land use on page 7 should be included under "Environmental Impact" since these items relate to project effects rather than "Environmental Setting."

Although the draft environmental statement expresses intended compliance with the Federal Reservoir Salvage Act (P.L. 86-523), the statement should indicate knowledge of whether or not archeological values are present or absent. Because archeological values are recognized cultural environmental values, project effects upon such resources, if present, should be discussed in terms of impacts, unavoidable adverse effects, alternatives, short-term versus long-term productivity, and irretrievable and irreversible commitments. For a detailed environmental analysis, an archeological survey of the project site is needed to: (1) determine whether or not archeological values are present and, if so, their significance and extent; (2) provide a basis for an adequate evaluation for environmental statement needs (for consideration in the planning and decision-making processes); and (3) to define any post-authorization salvage program and costs needed to mitigate loss to the archeological resource base.

The draft statement indicates that the National Register of Historic Places was consulted. We suggest that the Director of the Ohio Historical Society, who serves as the Ohio State Liaison Officer for Historic Preservation, be consulted to determine whether there are any cultural resources in the project area which may be in the process of nomination to the National Register.

Environmental Impacts

Some consideration should be given to the loss of fishery values and fish spawning potential as it relates to the Ohio River.

The effects that underground coal mining may have on structures of the project appear to have been adequately considered. Significant adverse environmental impact related to the geology of the area of the project is not anticipated.

In the draft environmental statement, no reference is made to effects on the hydrology downstream from the project area. We suggest some mention of this be included.

On page 8, the statement is made that "normal depths of the stream and its water velocities will be increased." In regard to velocities, this would be true only if the discharge were likewise increased; we suggest this statement be modified.

The term "vector control," referred to on pages 8 and 10, probably should be defined.

No mention is made of the possible effects of channel deepening at Adena and Dillonvale on groundwater resources. Some wells at these localities may tap shallow alluvium in the stream channels and deepening the channels might increase the potential for higher yields by facilitating induced infiltration. On the other hand, deepening the channel might make easier the movement of poor quality water from the stream to nearby wells. The above comments apply also to appropriate parts of the Watershed Work Plan, in addition to these specific comments:

Favorable Environmental Effects

Item (h) is not a favorable effect since the 46.8 acres of wildlife cover already exist in one form or another. Its replacement through artificial means will require many years before its value as habitat reaches the value of the existing natural condition. During this time, the replacement habitat will either be valueless or much lower in quality than it is at present.

Item (j) notes that an improvement in general esthetics will occur. This thought should be clarified to refer only to land treatments since channelization undoubtedly will result in greatly decreased esthetic quality of the watershed. Also, to many people the impoundment will be less esthetically pleasing than the existing natural stream.

Adverse Environmental Effects Which Cannot Be Avoided

This section needs to be expanded to include discussions of losses to fishery habitat and potential fishery values of presently degraded streams. Degraded watershed esthetics also should be included since remaining natural values are often in the stream bottoms. This watershed already has received tremendous damage from strip mining in the uplands. More large scale excavation, this time in the valley bottoms, will reduce remaining esthetic values to a minimum.

With respect to the first paragraph, page 11, sediment studies by the U.S. Geological Survey at Short Creek near Dillonvale indicate that bed materials consist of about 19 percent sand. These materials are carried by the flow in suspension about 7 percent of the time. Total discharge, including bedload, of materials of sand size and larger is estimated to be 10,200 tons annually at this station.

Alternatives

The first alternative listed should be expanded to array in greater detail the beneficial and adverse effects for the decisionmakers. The construction of nine small impoundments would not only be less damaging to the environment, but would also in some cases improve fish and wildlife habitat. The cost for this alternative is approximately the same as the initial cost of the proposed project. A combination of this alternative and alternatives 3, 4, and 5 would probably provide benefits equal to those of the proposed project.

<u>Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity</u>

The last paragraph on page 13 and the first full paragraph on page 14 do not relate to the topic and should be deleted.

Mention should be made of the length of time needed to produce the trees and other vegetaion in the natural areas to be destroyed by structural measures.

<u>Irreversible and Irretrievable Commitments of Resources</u>

In addition to the other commitments cited, the construction of a dam and inundation of 75.4 acres constitute an irreversible commitment of a relict northern forest plant species site.

The environmental statement discusses mineral resources generally but makes no mention of the loss of the minor coal resources in the area of the floodwater structure. The statement neglects to discuss the impact on the borrow area. Section 7, on page 14, should be revised to include comments on the minor coal resources that would be lost to this project and an estimate of the amount and impact of borrow and riprap.

In summary, we believe this work plan, if implemented, will do significant damage to the fish and wildlife resources of the study area. Further, this report does not conclusively demonstrate that the recommended plan provides the best overall flood control solution for the basin. From an environmental and possibly an economic standpoint, a series of small impoundments in lieu of stream channelization coupled with some nonstructural flood control measures may offer a more desirable solution. Until

more conclusive information is furnished to support the recommended plan, the Department of the Interior wishes to withhold its support for this work plan.

Sincerely yours,

Acting
Deputy Assistant Secretary of the Interior

Mr. Kenneth E. Grant
Administrator
U.S. Department of Agriculture
Soil Conservation Service
Washington, D. C. 20250

R. E. ~~Quilliam~~ Shaw, SCS, Columbus, Ohio

~~Shaw~~ file
~~Clegg~~

MAR 15 1973

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

MAR 9 1973

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
U.S. Department of Agriculture
Washington, D. C. 20250

Dear Mr. Grant:

This is in response to your letter of February 6, 1973, wherein you requested comments on the Watershed Work Plan and draft environmental impact statement for the Short Creek Watershed, Ohio.

The Department of Health, Education, and Welfare has reviewed the health aspects of the above project as presented in the documents submitted. This project does not appear to represent a hazard to public health and safety.

The opportunity to review the Watershed Work Plan and draft environmental impact statement is appreciated.

Sincerely yours,

Richard L. Seggel

Richard L. Seggel
Acting Assistant Secretary
for Health

R. E. Quilliam, SCS, Columbus, Ohio ✓

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (GWS/83
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: 202 426-2262

4 APR 1973

Mr. Kenneth E. Grant
Administrator, Soil Conservation
Service
Department of Agriculture
Washington, D. C. 20250

Dear Mr. Grant:

This is in response to your letter of 8 February 1973 addressed to Admiral Bender transmitting the draft environmental impact statement for the Short Creek Watershed, Harrison County, Ohio.

The concerned operating administrations and staff of the Department of Transportation have reviewed the statement. The Federal Railroad Administration commented as follows:

"The Federal Railroad Administration endorses the Short Creek Watershed Project. We assume that the construction design, as in other PL 566 projects where railroads are involved, will be coordinated with the appropriate chief engineering officer where any work affecting railroad structures is contemplated."

The Federal Highway Administration commented as follows:

"The proposed pool will periodically inundate part of a 3 mile section of Federal-aid Secondary (FAS) Route 1180 in sections 8, 14 15, 21 and 27, T 10 N, R 4 W. The proposed 10 mile stream channel modification appears to be adjacent to portions of FAS Routes 676, 699 and 674 for the remainder of the project.

"Our major concern is the EIS itself includes little on the proposed roadway. There is also a lack of discussion on the effect on traffic circulation in the counties that would result if the proposed project was implemented.

"In lieu of the above, we believe the final statement should address itself to the following questions:

1. To what extend would the public road system be inundated?

2. If inundated, what would the need or availability of alternate roadways be?

3. To what extent will existing roadway embankments and/or stream crossing require reconstruction or improved protection in order to minimize erosion?"

The Department of Transportation has no further comments to offer on the draft statement. We have no objections to the project nor to its implementation.

The final statement, however, should address the concern of the Federal Railroad Administration regarding coordination with the involved railroad and should state that such coordination was conducted. The final statement should also address itself to the questions raised by the Federal Highway Administration.

The opportunity for the Department of Transportation to review the draft environmental impact statement for the Short Creek Watershed Project is appreciated.

Sincerely,

J. D. McCANN
Captain, U. S. Coast Guard
Acting Chief, Office of Marine
Environment and Systems

APR 23 1973

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
1 NORTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

April 19, 1973

Mr. Robert E. Quilliam
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
311 Old Federal Building
Columbus, Ohio 43215

Dear Mr. Quilliam:

We have completed our review of the Draft Environmental Impact Statement (EIS) for the Short Creek Watershed Project in Harrison and Jefferson Counties, Ohio, as requested in your letter of February 6, 1973. On March 23, 1973, a representative of our agency conducted a field inspection with your staff and local sponsors of the proposed project.

We have classified our comments as Category ER-2. Specifically, this means that we have some environmental reservations regarding this project based upon the information presented in the EIS and our field review and investigations; also, we believe that the EIS does not contain sufficient information to fully assess the environmental impact of the proposed project. The classification and the date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act. The attached comments should be addressed in the Final EIS.

Our primary concerns relate to: impoundment of a creek of poor water quality; inadequate treatment of upstream discharges, particularly the Cadiz Disposal Treatment Plant; lack of comprehensive abatement strategies; ineffectiveness of past strip-mine reclaiming programs in preventing sheet and gully erosion with resultant sedimentation; the effects of mine drainage upon the proposed reservoir pool; the proposal to stock bass and bluegill in waters having high pH, total alkalinity, hardness and mineral content; the proposed channelization; and the secondary impacts of floodplain encroachment. Although the project satisfies the objective of providing flood protection to agricultural lands and urban properties, pollution control and public recreation have not been sufficiently considered to effectuate a comprehensive watershed management program.

Mr. Robert E. Quilliam
SCS - Columbus, Ohio

We thank the Soil Conservation Service for their assistance in our field review; and we appreciate the opportunity to review this Draft EIS. Please send us five copies of the Final EIS when it is filed with the Council on Environmental Quality.

Sincerely yours,

Donald A. Wallgren

Donald A. Wallgren
Chief, Federal Activities Branch

1. Description:

Project Measures:

The information presently included in this section is inadequate and should include the information on pages 5 to 7. A description of the proposed flood control structure and the dimensions of the modified channel reaches should be included here.

Environmental Setting:

With regard to current land use, the 59 percent of "other land" as broken down into 30 percent revegetated surface-mined area, 20 percent idle and 9 percent miscellaneous is vague and needs further clarification (see page 1). What percent of the watershed is currently being mined on the surface? Since mining is a major economic enterprise within the watershed, the EIS should correlate active mining land uses to the previous 59 percent figure of "other land."

Further description of the mined areas is necessary. Active strip mining land and reclaimed strip mining land should be shown on a map. The character, method, and effectiveness of areas reclaimed and revegetated should be reassessed. The quality of surface runoff from both reclaimed and unreclaimed lands should be a topic of discussion in the EIS. The general location of existing gob, refuse and overburden piles along Short Creek and its major tributaries should be mentioned.

Our recent field investigation of the project area revealed that the revegetative practices made on the 24,000 acres (or 30%) of the watershed disturbed by coal mining operations do not appear to have been as effective as was indicated in the EIS. Even though "all" of this land was supposedly graded and revegetated, we believe land treatment practices have been ineffective because of poor quality soils inhibiting flora growth, overgrazing, improper cultivation and non-conservative farming methods. These practices have contributed to serious sheet and gully erosion along both valley sides of Short Creek. This erosion exposes soil and rock susceptible to oxidation and weathering processes; i.e., acid formation and sedimentation. Since the watershed has an abundance of carbonates in the soil and surface waters, acids are generally neutralized. Uncontrolled sedimentation increases the sediment load to Short Creek and deposition in the channel. The proposed land treatment measures will minimize these problems.

With regard to flooding, the EIS should provide more detail on past flood occurrences, their flood frequency and extent of damage. The term, "periodic flooding," on page 2 should be clarified. A complete

Mr. Robert E. Quilliam
SCS - Columbus, Ohio

history of channelization work in this watershed should be included in the EIS with a description on how successful past channelization projects have been in controlling flood damage in this watershed.

Using the land use percentages: 15 percent cropland, 16 percent grassland, 10 percent woodland and 59 percent other; and the average annual soil loss rates of 7.64 tons/acre on cropland, 2.2 tons/acre on pasture, 2.15 tons/acre on woodland and 1.95 tons/acre on "other land"; it appears that the annual soil loss from the entire watershed is in the order of 230,000 tons/year. How does this figure relate to the figure of 18,400 tons/year as denoted on page 3, paragraph 3? How severe is soil loss from the 24,000 acres of land disturbed by strip mining?

Past water quality data on Short Creek is available from the State's Storet System for monitoring stations located at Cadiz, Adena and Dillonvale. Bottom sediment data should be provided for all areas to be dredged, excavated or channelized. The location of spoil disposal areas should also be noted. The quality of dredge spoil and the location of spoil disposal areas will effect the design of disposal sites and should be determined as soon as possible. All polluted spoil must be confined in such a manner as to not allow any degradation of ground or surface waters.

The interim water quality management plan for pollution abatement for southeast Ohio tributaries has been tentatively approved but is presently not complete. Specific water quality standards have not been set for this stream because of the proported acid mine drainage problem and the minimum treatment goal that was established for secondary treatment. The EIS should briefly point out the type and adequacy of sewage treatment for each of the communities along Short Creek and its major tributaries. Adena's plant has secondary treatment with chlorination facilities. Currently, chlorination is not being used. Dillonvale presently has primary treatment with no chlorination and will have to upgrade their treatment to secondary. The Deluca Packing Company in Warren Township, Jefferson County is the only large industrial discharger of whom we are aware in this watershed that does not meet the basin guidelines for secondary treatment. This plant discharges to Connorville Creek, a tributary of Short Creek.

With regard to dischargers upstream of the proposed dam, current effluent data from each significant discharger should be obtained and evaluated for the potential long-term effects that these pollutional sources will have upon the 68 acre pool. The information provided on

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page 3, paragraph 5 is too general. Cadiz is operating an overloaded secondary treatment plant with post chlorination that is used only in the summer; this plant frequently discharges to Middle Fork Short Creek at a point of zero low flow. The Cadiz Sewage Treatment Plant will need the best available treatment technology including appropriate mechanisms for highly efficient BOD, suspended solids and nutrient removals, if a reservoir is to be constructed downstream.

The treatment of wastewater discharged from any water supply facilities in the watershed during filter backwashing operations should also be addressed. Since the groundwaters are fairly hard, we presume that they are still being softened by the lime-soda ash process as they were in 1941.

Despite the fact that water quality data indicates high pH values for Short Creek, occasional releases of acid mine wastes may adversely affect aquatic populations. Water quality standards for Short Creek are pending identification of the sources for mine waste drainage and the development of abatement strategies. The Ohio EPA and the Department of Natural Resources should be contacted to provide the following information: the names of coal companies operating impoundments above the proposed reservoir, the purpose of the ponds (i.e. as temporary storage for release during high flow periods and/or treatment lagoons for metal ion precipitation and pH reduction), the frequency and quality of water releases, and if known, the severity of uncontrolled acid mine drainage. The nature of the discharge from area oil wells should also be discussed. This background information is necessary to determine the viability of the proposed reservoir.

As early as 1943, there is documentation that Short Creek and streams flowing through Dillonvale were all polluted with mine and human wastes (Ohio DNR, Geology of Water in Ohio, Bulletin 44). Other studies of the Short Creek watershed made in 1966 revealed that the Short Creek Main Stem, South Fork Short Creek, North Fork Short Creek, Perrin Run, Long Run, Piney Fork and Little Short Creek are streams continuously affected by mine drainage; and the Middle Fork Short Creek and upstream portions of Piney Fork are streams intermittently or potentially affected by mine drainage (Report for Development of Water Resources in Appalachia (RDWRA), Appendix C; U. S. Army Corps of Engineers, June 1969). These streams exhibited at that time high concentrations of one or more of the constituents prevalent in mine drainage (i.e. hardness, sulfate, iron, and manganese) and generally contained alkalinity in excess of acidity near Short Creek's confluence with the Ohio River.

Mr. Robert E. Quilliam
SCS - Columbus, Ohio

Water quality data from monitoring stations at Cadiz, Adena, and Dillonvale (during 1970 and 1971) revealed concentrations of sulfate, manganese, zinc, calcium, magnesium, lead, iron, total alkalinity and hardness which get progressively higher further downstream. Examination of the creek during our inspection showed that the color of the creek became a progressively deeper and darker red-brown going downstream. The reddish hues are probably caused by a combination of iron compounds and humic substances leached from gob piles, overburden, exposed coal and shale strata.

Are there any rare or endangered species inhabiting or known to migrate through the area?

The proposed project is mentioned in RDWRA and was said to be completed by 1980. The report indicated that impoundments for areas off the Ohio River in this reach could be a likely source of additional water supply if significant development would require expansion of existing water supply facilities. The report also indicated that problems have been created with mine drainage entering existing reservoirs in this sector of the Ohio River basin but did not specifically reference any on Short Creek. However, a number of impoundments do exist in the Short Creek watershed; and it might be helpful to know the effect that this mining area has had upon the water quality of these impoundments and storage ponds even though they are not necessarily being used for water supply. What is the existing water quality in the impoundments located between Cadiz and Unionvale?

In reference to number 8 on page 6, piling spoil in wooded and brushy areas should be avoided unless it fits into the character of the terrain. In all cases, it should be seeded, and if possible sodded, whether it is piled or spread.

2. Environmental Impact:

On page 8, it was stated that project installation will eliminate health hazards associated with flood damage to water supply and waste disposal systems. The EIS should address these health hazard impacts in more detail, i.e. their location, extent and kind of hazard, duration, frequency of occurrence.

The status of recreational development in the valley should be mentioned, particularly on reclaimed strip mined land. Ownership of this land should also be addressed. Can any of these programs be related to the proposed project, particularly the strip mined areas on the floodplain?

Mr. Robert E. Quilliam
SCS - Columbus, Ohio

With most of the Middle Fork Short Creek stream flow composed of sewage treatment plant effluent, coal processing waste waters and drainage from strip mines, strip ponds and feedlot areas during low flow periods, water quality will undoubtedly degrade in the 68 acre pool unless action is taken to clean up these and other pollutional sources prior to reservoir filling. In fact, we do not recommend filling of the reservoir pool until these pollutional sources are abated; and assurance is given that water quality in the reservoir pool will not degrade.

The need to rechannelize or merely clear the portion of Short Creek above Adena should be assessed. The flow regime of Short Creek after channelization and dam construction should be described. Pages 24 and 25 of the Work Plan should be included under this section with the discussion of channel modification on page 8 of the EIS.

We note that poor water quality resulting from influxes of mine drainage and sediment has limited the fishery in Short Creek to carp, suckers and catfish. However, it is proposed to stock the reservoir with bass and bluegills. The U.S. Bureau of Sports Fishery and Wildlife and the Ohio Department of Natural Resources should be contacted with regard to the tolerance of the fish to be stocked in waters having high pH, total alkalinity, hardness and mineral content. Our preliminary research has revealed the following information:

> Zinc concentrations as high as .390 mg/1 have been monitored at the Cadiz water sampling station in 1970 and 1971. It is toward fish and aquatic organisms that zinc exhibits its greatest toxicity particularly in soft water. However, in hard water, calcium is antagonistic toward zinc toxicity. It has been reported that for mature fish the lethal limit in water containing 1.00 mg/1 of calcium is only .30 mg/1 zinc but in water with 50 mg/1 of calcium, as much as 2.00 mg/1 zinc is not toxic (Water Quality Criteria, State of California Water Quality Board, 1963). With calcium concentrations ranging from 99.2 mg/1 to 123.2 mg/1 in the past at Cadiz, zinc toxicity should not be a problem to mature fish as long as zinc concentrations have not increased significantly since 1971 and do not accumulate to toxic levels in the impounded area. The potential adverse impacts of zinc accumulating to toxic levels affecting mature fish and of zinc toxicity to non-mature fish (i.e. fry and fingerlings) and spawning conditions should be addressed. Research conducted for our agency revealed that a zinc concentration of .250 mg/1

Mr. Robert E. Quilliam
SCS - Columbus, Ohio

appears to inhibit spawning in adult bluegills brought into breeding condition in dechlorinated municipal water (containing no added zinc) and to cause complete mortality of bluegill fry. The same water containing only 1/100 or 1/34 of this concentration do not have these effects. (The Use of Fish Movement Patterns to Monitor Zinc, US EPA, December, 1971).

According to water samples taken in 1970 and 1971 at the Cadiz station, pH has ranged from 8.40 to 10.0 with a mean of 9.22. This mean exceeds the State's General Water Quality Standards set for aquatic life which is 8.5. The Aquatic Life Advisory Committee of the Ohio River Valley Water Sanitation Commission concluded in the past that direct lethal effects of pH are not produced within a range of 5 to 9.5, but from the standpoint of productivity it is best to maintain the pH in the range of about 6.5 to 8.2(Water Quality Criteria, 1963).

The age and quality of any tree lanes or lots which will have to be removed or will be adversely affected by the new hydraulic conditions should be mentioned.

4. Adverse Environmental Impacts Which Cannot Be Avoided:

Impacts of noise and air pollution emanating from construction operations should be addressed. Construction debris and landscape debris should be disposed in a manner other than open burning.

Since wildlife habitat will be reduced by 92.7 acres, this may result in temporary overpopulation of the remaining habitat along Short Creek. Periodic flooding on the 280 acres of the detention pool may prove detrimental to the wildlife habitat development in the island areas.

5. Alternatives:

The National Flood Insurance Act of 1968 (PL 90-448) authorized the establishment of the Federal Insurance Administration (FIA) under the US Department of Housing and Urban Development. FIA implemented the National Flood Insurance Program which enables persons to purchase insurance against losses resulting from property damage arising from floods or mudslides. The EIS should acknowledge: (1) if Jefferson and Harrison Counties are eligible to receive

Mr. Robert E. Quilliam
SCS - Columbus, Ohio

Federally subsidized flood insurance, and (2) if they have adopted proper regulations to control and enforce minimum floodplain use. The key to reducing flood damage and loss of life is compatible land use planning and control, at times coupled with structural flood control measures. Structural measures when not accompanied by controls over floodplain use have encouraged people to move closer to stream channels and increased the potential for greater property damage.

With regard to the non-structural alternative of floodplain zoning, the EIS indicated that "zoning would provide no realistic solution..." Although this alternative may not be adequate in itself because of existing homes and buildings located in the floodplain, floodplain zoning should not be eliminated from the total plan. In fact, we recommend that a floodplain management plan incorporating compatible land use zoning be developed before project construction. Stricter regulation of the floodplain use is needed than that proposed on page 29 of the Work Plan.

6. The Relationship Between Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity.

Considering present water quality conditions it appears that the proposed wet sediment reservoir could have very little aesthetic or fish and wildlife development potential at this site. Statements regarding the value of such an impoundment should be carefully qualified to indicate the interdependence with an improvement in the use of water and land resources.

The EIS indicates that channelization may provide different and presumably comparable habitat conditions for fish. Details should be provided to support this view. It is our belief that the adverse environmental effects of channelization far outweigh any possible benefits and that its effects should be viewed as long lasting rather than temporary. Although short-term benefits may be achieved both aesthetically and environmentally from this proposed channelization, it should be realized that when water quality improves, pollution sensitive organisms would propagate, bio-productivity would increase and species would become more diversified. Without channelization, stream recovery could be complete in a short period of time. With channelization, stream recovery, even with improved water quality, may never be complete because the stream characteristics have been drastically altered.

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
1 NORTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

~~Quilliam~~
~~Holmes~~
~~Kirk~~
Edwards
Please Handle

OCT 24 1974

Mr. Robert E. Quilliam
State Conservationist
U.S. Department of Agriculture - Soil Conservation Service
311 Old Federal Building
Columbus, Ohio 43215

Dear Mr. Quilliam:

This letter is in response to a request made by your staff during our September 16, 1974 meeting (attendance sheet attached) for comments regarding the proposed treatment of EPA's April 19, 1973 comments on the Draft Environmental Statement (EIS) for the Short Creek Watershed Project in the Final EIS.

In general, we find that such meetings are benefical because they provide better understanding of agencys' goals and responsibilities and deeper insight into project objectives and environmental impacts. For these reasons, we encourage similar meetings on future projects when necessary.

The following numbered comments correspond respectively to EPA's 30 comment paragraphs on the Draft EIS. Please note that the numbered comments below pertain only to issues or subject areas requiring additional study or information.

3. A better description of active and reclaimed mining lands with regard to acreage and the quality of surface mine drainage upstream of the dam is necessary. This information will enable a more thorough discussion of effects from surface mine drainage upon the proposed reservoir.

5. Please confirm that the reach of Short Creek above Adena has not been channelized in the past.

7. The quality of bottom sediments should be determined in a manner acceptable to our agency. If they are considered polluted by our attached criteria, then disposal of dredged spoil in waters will be prohibited. Disposal of polluted dredged spoil near surface waters will require special handling and pollution design measures to prevent possible entry of contaminants into ground or surface waters.

9. The long-term effects upon water quality in the reservoir from municipal and industrial discharges require a detailed assessment.

10. Please confirm if ground waters in the basin are still being softened by a lime-soda process; and if so, the effects of backwash discharges upon surface waters should be addressed.

11. Mine (of significant size) pond locations, their purpose, general water quality, and, if known, the frequency of overflows should be noted.

16. The proposal to pile spoil near the stream should be avoided if surface soils conditions are unstable and conducive to erosion. While the disposal of polluted spoil will require special handling, disposal will be dependent upon the nature and location of disposal sites.

21. It was agreed that the Fish & Wildlife Service, Ohio EPA and Ohio DNR will be contacted regarding fish tolerancy.

30. Documentation and studies should be provided to support the contention that channelization may provide different and presumably comparable habitat conditions for fish.

In summary, we note that the proposed reservoir will remain dry until water quality in Short Creek improves to a degree acceptable by Ohio EPA and U.S. EPA.

We appreciate the opportunity to meet with you and assist in Final EIS preparation. We will be looking forward to reviewing the Final EIS.

Sincerely yours,

Gary A. Williams

Gary A. Williams
Chief
Environmental Impact Statement
Review Section

ROSTER OF PARTICIPANTS
Short Creek Project, Ohio

		TELEPHONE NUMBERS
1.	Robert Kay, EPA	312-353-5757
2.	Wayne Gorski, EPA	312-353-6261
3.	Jerry Bernard, SCS	614-469-6660
4.	Marshall D. Edens, SCS	614-469-7435
5.	Paul M. Brady, SCS	614-469-6660
6.	Gary A. Williams, EPA	312-353-5757

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

Mr. Robert E. Quilliam
State Conservationist
United States Department of Agriculture
Soil Conservation Service
311 Old Federal Building
Columbus, Ohio 43215

Dear Mr. Quilliam:

As requested in your April 5, 1976 letter, we have completed our review of the preliminary Final Plan and Final Environmental Impact Statement (EIS) for Short Creek Watershed. Primarily, we examined your proposed responses to our April 19, 1973 and October 24, 1974 comments on the Draft EIS.

In general, the proposed responses adequately address our comments. The response to comment 7 on page II-143 should be clarified to indicate that a bottom sediment analysis has not yet been performed, but will be conducted as part of final design. The analysis should be sent to us at that time for a determination as to its pollutional characteristics and necessity for confinement.

It is stated on page II-97 that Type I Wetlands will be reduced in the channel work areas from 661 acres to 319 acres. Since EPA and several other agencies have policies directed toward wetland preservation, an indication of the present use and quality of the wetlands to be lost should be given in the Final EIS.

We appreciate the opportunity to review this preliminary Final EIS. If you should have questions regarding our comments, please contact me at 312-353-5756.

Sincerely yours,

Gary A. Williams

Gary A. Williams
Chief,
Environmental Review Section

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State of Ohio Environmental Protection Agency, Box 1049, 450 East Town Street, Columbus, Ohio 43216 (614) 469-35

APR 5 1973

April 3, 1973

Re: Short Creek Watershed Project, Harrison and Jefferson Counties
USDA-SCS-ES-WS (ADM) 73-17 (D)

United States Department of
Agriculture
Soil Conservation Service
311 Old Federal Building
Columbus, Ohio 43215

OhioEPA

John J. Gilligan
Governor
Dr. Ira L. Whitman
Director

Attention: Robert E. Quilliam, State Conservationist

Dear Sir:

The Ohio Environmental Protection Agency has been charged, by the Governor, with the lead agency and review coordination responsibilities for the State of Ohio on Federal Environmental Impact Statements. The above referenced draft Environmental Impact Statement was reviewed by sections of the Ohio Environmental Protection Agency, the Ohio Department of Natural Resources, the Ohio Department of Transportation, the Ohio Department of Economic and Community Development, the Ohio Department of Agriculture, the Southeastern Ohio Health Planning Association, the Jefferson County Regional Planning Commission, the Brooke-Hancock-Jefferson Metropolitan Planning Commission and the Forest Audubon Club of the Ohio Audubon Council. The following comments constitute those received from the above agencies and have been coordinated under the auspices of the State Clearinghouse.

i) <u>The environmental impact of the proposed action</u>

Conservation land treatment measures are discussed in conjunction with the overall project undertaking in this section of the document. If no Federal cost sharing were available, what would occur relative to the number of acres of land treatment measures planned to acres which would actually receive treatment? What impact would this possibility have on the overall project undertaking?

On page 9, several impacts of this project are mentioned briefly. The statement appears that the dam will reduce downstream

sedimentation. However, no mention is made that by relieving the water of its load, and by impounding it, the erosive potential is increased. Properly designed spillways or overflow structures can alleviate the problem to a certain degree. Nevertheless, this situation is an impact associated with the project and as such should be identified and remedy measures discussed.

Thirty to thirty-five percent of the drainage area is owned by coal companies. The area has been strip mined during the past 25 to 30 years and reclamation has been controlled by the laws in effect at the time of mining. There are still many denuded areas in the Middle Fork drainage basin. With such existing conditions, the projected life of the dam may be shortened. Those barren and easily erodible areas if adequately reclaimed prior to construction of floodwater retarding structures would add to project life. Strip mining continues in the watershed, however, and many areas previously mined will be stripped again by use of the larger shovels now available to remove more overburden to reach the deeper veins of coal. The 12% reduction in erosion and sediment production appears to refer to that portion of the watershed that borders the channel and other agricultural lands. Amounts for the strip mined areas appear to be omitted.

The stream fishery is described as limited. Carp, suckers and catfish are listed as the major sport fish identified in the project area. The Ohio Department of Natural Resources, Division of Wildlife has conducted fish management stream surveys which show that largemouth bass, smallmouth bass and rock bass are present in the watershed. These species inhabit the pools and rock bank areas of all major forks of Short Creek. Habitat is found in the areas of good water quality for the most part located in the upper watershed above Adena. The channelization would more than disrupt the aquatic habitat, the ecosystem would be destroyed, showing little or no resemblance to the former stream. Increased turbidity, due to increased velocity, will be detrimental to sport fish as they rely on sight for feeding. Fish cover is important as a means of shelter from current. Removal of cover could be mitigated by the construction of artificial pools and undercut banks which would not disrupt stream flow.

A statement appears on pages 8 and 9 that the sediment pool would disrupt aquatic vertebrate and invertebrate habitats. However, it is felt that those habitats would be destroyed as lake and river ecosystems are completely different.

Clarification is necessary as to the disposition of the existing roadways to be inundated by the pool. Will they be relocated out of the pool, raised above pool elevation or a combination of both? Who will bear the cost of these highway adjustments? Are they included in the project cost?

There should be some discussion pertaining to the prior coordination between SCS and the Ohio Department of Transportation relative to the future location of State Route 150. It should be noted that several alternatives for State Route 150 in the Short Creek Valley were presented and a preferred route was indicated. The discussion should include statements that alternate locations on either side of the pool would encroach on the pool area. However, the small percent storage reduction could be compensated for by slightly modified design of the reservoir structure.

ii) <u>Any adverse environmental effects which cannot be avoided should the proposal be implemented</u>

This section is severely lacking in content. There is no real attempt to discuss the adverse impacts associated with the project. The ability to adequately address adverse impacts in five one sentence statements is questionable.

This document fails to adequately assess the potential adverse downstream impacts associated with this project. A brief statement appears in the impact section to the effect that water velocity and duration of flooding downstream will be altered by the reservoir. Downstream impacts associated with the reservoir and the channel modifications should be discussed in detail. Several areas that should be addressed are the possibilities and extent of increased erosion, turbidity and flooding downstream.

One adverse impact not identified is the loss of 244.7 acres of woodland and brush which would be inundated or destroyed. This number per se does not appear to be a significant number of acres. However, when one considers the fact that the watershed is only 10% forested, this figure becomes significant.

A discussion of water quality parameters is lacking in this document. Some mention is made of high readings for sulfates, iron, manganese, aluminum, conductivity and hardness. How high are these values, when where the readings taken and what are the average values for these parameters? Do the same high readings persist throughout the year or only during low flow

periods? The document fails to adequalely assess the dissolved oxygen concentrations in the streams to be channelized. Specifically, what effect will the project have on dissolved oxygen concentrations? Water temperature, flow rates and assimilative capacity (as it relates to sewage treatment plants) are either poorly discussed or not considered at all in this Environmental Impact Statement.

One benefit of the implementation of this proposal is protection for water and sewage treatment plants. The exact number of such plants in existence in the project area should have been discussed. Relative to sewage treatment plants, the natural recovery of a stream is an important point to consider, especially in terms of allowable loadings (BOD) that can be discharged and still allow water quality standards to be met. Channelization could impact the assimilative capacity of the channelized portion of the stream. Channelization may also move the sag point downstream possibly to an undesirable portion of the stream (i.e., at the outfall of another sewage treatment plant). Such potentially negative impacts should be addressed.

Specific information relative to the proposed reservoir is basically confined to sediment pool acreage and acreage occupied by structural elements. What is the projected mean depth of the reservoir? The water flowing into the proposed reservoir is poor quality sediment loaded water from the Cadiz sewage treatment plant, the Georgetown Coal Processing Plant and strip mine areas. At times, the Cadiz plant is reported to provide 50% of the flow rate in the Middle Fork of Short Creek. There are several adverse impacts associated with this situation. Will this reservoir become eutrophic at its outset? Are algal problems anticipated? Will various draw down levels be provided? How safe will the reservoir be for recreational use? How will sport fish with which the reservoir is to be stocked survive the conditions discussed above? Furthermore, what is the anticipated water quality discharge from the reservoir in terms of dissolved oxygen, temperatures and some critical nutrients such as phosphates and nitrates? What is the projected discharge rate of the reservoir and is low flow augmentation designed for the reservoir?

Disposition of the spoil dredged from the river channel should have been discussed at greater length. Specifically, what criteria will be used to determine whether the dredged material is polluted? Some indication should appear as to the volume of polluted material that will need special disposition. What burial areas exist for disposition of the polluted dredge material? Will such areas prevent leachate from entering the groundwater? If the polluted material is to be piled in

the floodplain, what measures will be employed to preclude its reintroduction into the watercourse?

iii) Alternatives to the proposed action

This section is severely lacking in data. An actual comparison of alternatives is very difficult. For example, no detailed discussion appears for the nine reservoir sites that were evaluated. What was the nature of those reservoirs and what degree of flood reduction would they provide? How were the costs associated with floodproofing determined? Were those costs evaluated from the standpoint of employing flood insurance to undertake the floodproofing? The alternative of channelization alone as proposed by the Corps appears to be less costly and less disruptive. What parameters were used to determine the increased sedimentation downstream? Could that approach coupled with land treatment measures decrease the downstream sedimentation problem? Finally, costs are given for all alternatives except the alternative being discussed in this proposal. What is the cost of this project?

One alternative not adequately explored is that of obtaining flood insurance eligibility to protect existing structures and residents affected by flood damage and adopting flood plain zoning to prevent further development in the flood hazard areas thereby preventing further flood damage. Could this alternative coupled with installation of proposed conservation land treatments mitigate most of the problems in the project area? Would these two approaches and construction of some number of reservoirs be desirable and effective?

Until such data and other alternatives are assessed and presented, it is impossible to evaluate the alternative chosen.

iv) The relationship between local short term uses of man's environment and the maintenance and enhancement of long term productivity

Channel modification is a short-term approach. Long-term productivity will depend upon conservation practices actually applied to the land. In addition, it is strongly recommended that the two municipalities adopt flood plain zoning regulations to preclude future flooding problems within the flood hazard areas. Discussion should occur relative to regulating the land below the reservoir so as to preclude development in what might be considered, at least short-term, as a protected area.

In addition, discussion should appear that details conservation

and implementation schedules to insure the long-term productivity in the watershed. The vegetative strips are an important step toward maintenance and enhancement of long-term productivity. However, maintenance may be problematic. Who will enforce the prohibition on mowing prior to July 1? What agency will insure that no farming occurs on those vegetative strips? This land treatment program can only succeed with full cooperation or participation of land owners in the watershed. Will regular inspections be made and appropriate actions be taken against violators?

v) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented

As agriculture, forestry and wildlife will be permanently altered at the dam site, sediment and detention pools, these situations should be discussed as an irretrievable commitment of resources.

General Comments

There is a general lack of supportive data in evidence in this document. Some essential data is missing altogether. Although the major problem in the watershed is identified as flooding, no flood frequency data is presented. In addition, flood levels are not identified. Flooding is said to cause millions of dollars in damage. Figures to detail damages should be provided. Furthermore, actual cost of the project is not given. How was the benefit cost ratio determined?

The last paragraph on page 4 of the document needs clarification. The Ohio Department of Natural Resources, Division of Forests and Preserves indicates that they have no project within the watershed. The Jefferson and Harrison Reclamation Areas operated by that Division are not within the boundaries of the watershed.

The game benefits associated with the reservoir are questionable. Constructing islands in shallow portions of impoundments is a good wildlife management practice. However, in this case the islands proposed are in the sediment pool and no mention is made of their height. Inasmuch as wildlife reproduction (and specifically waterfowl nesting) begins in mid-March or before, this could be early enough to occur in a high risk period of spring floods. It would seem that low nesting islands in the sediment pool of a flood control reservoir might be detrimental to wildlife reproduction. Furthermore, this part of the State is lacking in waterfowl other than woodduck. There is little use by migrating waterfowl except during periods

of such severe weather that migration is interrupted. The islands should be built to as high a level as possible, and that a minimal amount of clearing be done particularly around the shore of the permanent pool and the end where the islands will be located. This would be a significant improvement in habitat for woodduck and would benefit several furbearers and song birds even if trees were destroyed by high water levels.

We appreciate the opportunity to review and comment on this draft Environmental Impact Statement. We look forward to receipt of the final environmental statement wherein our reservations and concerns about this project will be addressed.

Very truly yours,

Ira L. Whitman

Ira L. Whitman, Ph.D.
Director

cc: Wm. B. Nye, Director, Ohio Department of Natural Resources
State Clearinghouse, 62 E. Broad Street, Columbus, Ohio

ILW/jt

R. E. Quilliam, SCS, Columbus, Ohio ✓

APR 17 1973

THE APPALACHIAN REGIONAL COMMISSION
1666 CONNECTICUT AVENUE
WASHINGTON, D.C. 20235

OFFICE OF
FEDERAL COCHAIRMAN

APR 11 1973

Mr. Kenneth E. Grant, Administrator
Soil Conservation Service
U. S. Department of Agriculture
Washington, D. C. 20250

Dear Mr. Grant:

We have reviewed the Work Plan for Short Creek Watershed, located in Harrison and Jefferson Counties, Ohio, as well as the draft environmental statement. We find nothing in the Work Plan which conflicts with Appalachian investments.

In reviewing the environmental statement, we note the following:

1. Sedimentation at the Ohio River is reduced by only 1,225 tons per year, a reduction of only 12 percent. This appears to be a very slight reduction. To what extent can more extensive land treatment measures improve the level of sedimentation reduction? To what extent is the level of sedimentation related to farming operations, as opposed to stream bed erosion, etc.?

2. The statement and Plan allude to the presence of strip and other mining operations and the significant level of land restoration, but there is no discussion of the level of environmental degradation still attributable to mining and treatment measures needed (if any) to reduce siltation and improve water quality.

3. We would strongly suggest (in spite of the level of development, especially urban, in the watershed) that zoning or other development controls be initiated. Obviously, such controls would do little to protect existing investments, but they would provide needed power to restrict future flood plain development, even though only one or two homes or businesses might be affected. Additionally, controls and other measures could assist in qualifying municipalities for Federal Flood Insurance.

We appreciate the opportunity to comment on the Short Creek Work Plan and environmental statement.

Sincerely,

DONALD W. WHITEHEAD
Federal Cochairman

NATIONAL AUDUBON SOCIETY — CENTRAL MIDWEST REGIONAL OFFICE

[illegible]

MAR 30 1973

R. E. ~~Quilliam~~, SCS, Columbus, Ohio

March 15, 1973

Miss Norma Weisner
Federal Coordinator
Environmental Assessment Section
Ohio Environmental Protection Agency
Box 118, 450 E. Town Street
Columbus, Ohio 43216

Re: SHORT CREEK WATERSHED PROJECT, DRAFT ENVIRONMENTAL STATEMENT

Dear Miss Weisner:

Enclosed are the comments and a letter copy from the Forest Audubon Club in regard to the Environmental Impact Statement on the Short Creek Watershed project in Harrison and Jefferson counties, Ohio. You will see from the remarks you requested that our local Audubon group feels the project would be generally advantageous although there is a strong need for flood plain zoning and restrictions on the use of the flood plains.

At this point I feel that the Ohio Audubon Council and the National Audubon Society would go along with the recommendations of the Forest Audubon Club.

Sincerely,

John L. Franson
Central Midwest Representative

RECEIVED MAIL ROOM
1973 MAR 21 PM 12:59
SOIL CONSERVATION SERVICE
WASHINGTON, D.C.

Attachment

cc: Mr. Kenneth Grant, Soil Conservation Service
Mr. Russell Train, Council on Environmental Quality
Mr. William Ruckelshaus, Environmental Protection Agency
Mr. William Nye, Ohio Department of Natural Resources
Mr. Charles Callison, National Audubon Society
Mr. John Gallagher, Ohio Audubon Council
Mr. Clinton Banks, Forest Audubon Club

3-8-73

Mr. John L. [illegible]
1020 East 20th St.,
Owensboro, Ky. 42301

Dear John:

Received the O. E. P. A. Environmental Impact Statement, re. The Short Creek Watershed in Harrison and Jefferson Counties, Ohio.

I studied it carefully and sent it to Huber C. Shelton and he studied it. Wed. Mar. 7, Huber and I accompanied by Mr. Earl Nelson director of the S. C. S. for the two counties toured the area. We drove along and walked along practically all the channelization sections. We visited the dam site, and the area of the permanent pool, also the upper reaches of thetotal flood, the highest expected in a 100 year period.

The area to be channelized, at some times is a fast running stream but at periods of low water I have seen parts of it when it looked like an open sewer. A large portion of the length have housed on one or both sides the stream and much rubbish is dumped along the banks. The woody or bushy areas along the streams are poor and will not be much loss.

Shelton and I both feel that the stream channelization, in this case will be an improvement.

The dam and pool will not damage any very valuable land as most of the land in the area is not being used to a very great extent. At the time of floods, some quite good areas will be inundated. That of course will be periodic and vary from year to year and flood to flood. The islands they mention, in the pool, as stopping places for waterfowl may or may not be used. This section of the country is situated between the flyways and migration is rather light, but we do see some on some of the ponds and lakes that we have.

We feel that this dam will be some improvement to the valley, providing that animal and human waste can be kept from accumulating and forming a big cesspool.

We have one thought in regard to the flood plain below the dam. The fact that the dam should prevent a flood is no guarantee. The area should be zoned and no expensive building permitted. It could be costly later. There is always the danger of a super flood. A remote possibility but it should be considered, a super flood and a dam failure, with the South and North Forks of Short Creek flooded would put Adena in a very bad situation. Also if Piney Fork of Short Creek, south of Dillonvale was flooded Dillonvale would be hard hit.

After studying this area and thinking of others we feel that Ohio needs some long range land use planning and very important Flood Plain Zoning.

I hope this report will be of some use to you.

Sincerely

Clinton S. Banks

Clinton S. Banks.

P.S. You will note that I have filled out the statements on a separate sheet. You can check them and change them if you wish. The five statements are rather difficult to provide a suitable answer.

Clint

1. The environmental impact of the proposed action.

To most of the area affected by the channelization, it will be an improvement. The dam and pool will be of some benefit, providing that farm animal and human waste can be prevented from accumuating and formin a large ceaspool.

2. Any adverse environmental effects which cannot be avoided should the proposal be implemented.

A few places would have water near them and would need access roads to get in and out during floods. Some sections of road must be re-routed.

3. Alternatives to the proposed action.

Move off the flood plain and let nature take its course. That of course would be to expensive and out of the question.

4. The relationship between local short-term uses of man's environment and the mainteance and enchantment of long-term productivity.

A small area of the total watershed will actually be tken out of production. The short term use of this area seems to be from flood to flood, the relationship betwwenthis and Long-term productivity, would be peace of mind. This might lead to a laxness of attitude that might prove disasterous in time of a big flood.

5. Any irreversible and irretrievable commitments of resources which would be involved in the proposed action shoulc it be implemented.

I do not know of any.

Other comments. If this project is implemented steps should be taken to guard against any more developement on the flood plain that might at some time in the future prove much more coatly and perhaps disasterous.

MAR 22 1973

BROOKE-HANCOCK-JEFFERSON
METROPOLITAN PLANNING COMMISSION
3600 MARLAND HEIGHTS ROAD
WEIRTON W VA 26062
TELEPHONE AREA 304-748-1424

March 20, 1973

Mr. Robert E. Quilliam
State Conservationist
United States Department of
Agriculture
311 Old Federal Building
Columbus, Ohio 43215

Dear Mr. Quilliam:

Subject: The Short Creek Watershed Project Draft Environmental Statement; USDA-SCS-ES-WS-(ADM)-73-17(D)

The Brooke-Hancock-Jefferson Metropolitan Planning Commission, at its March 14, 1973 meeting, approved the attached staff report and recommended that the subject statement be accepted once due consideration had been given the attached comments.

Because of the thoroughness of your review procedure, most of our metropolitan clearinghouse reviewers decided to send comments either to Ohio EPA or to yourself. Thus, we have only our own comments to enclose.

If on future projects you need coordination of local review and comment, our metropolitan clearinghouse function is at your service.

Very truly yours,

Robert W. Wirgau

Robert W. Wirgau, AIP
Executive Director

RWW:bjg

Attachment

BHJ STAFF COMMENTS
on the
DRAFT ENVIRONMENTAL IMPACT STATEMENT
for the
PROPOSED SHORT CREEK WATERSHED PROJECT

The Brooke-Hancock-Jefferson Metropolitan Planning Commission staff has prepared these comments on the subject draft statement for review by the full Commission at their regular meeting on March 14, 1973.

1. The draft statement appears to present very fairly the prevailing environmental situation and the probable changes involved through the implementation of this project.

2. We urge the SCS to budget sufficient funds in their project design to employ impartial, full-time monitoring inspectors to assure the use of the techniques listed on pages 5 and 6.

3. During the meeting of Conservancy District Directors and project sponsors on March 8, 1973, in Steubenville, the alternative of constructing the Fox Bottom Reservoir as a dry flood retarding structure initially and later creating the 68-acre permanent pool was discussed. If this alternative is still a possibility the SCS should include its probable effects in the Final Environmental Impact Statement.

The staff advises the BHJ Commission to recommend acceptance of this draft environmental impact statement with the proviso that the preparer consider the above comments in his final EIS.

Staff Report by: John R. Beck
John R. Beck
Associate Planner

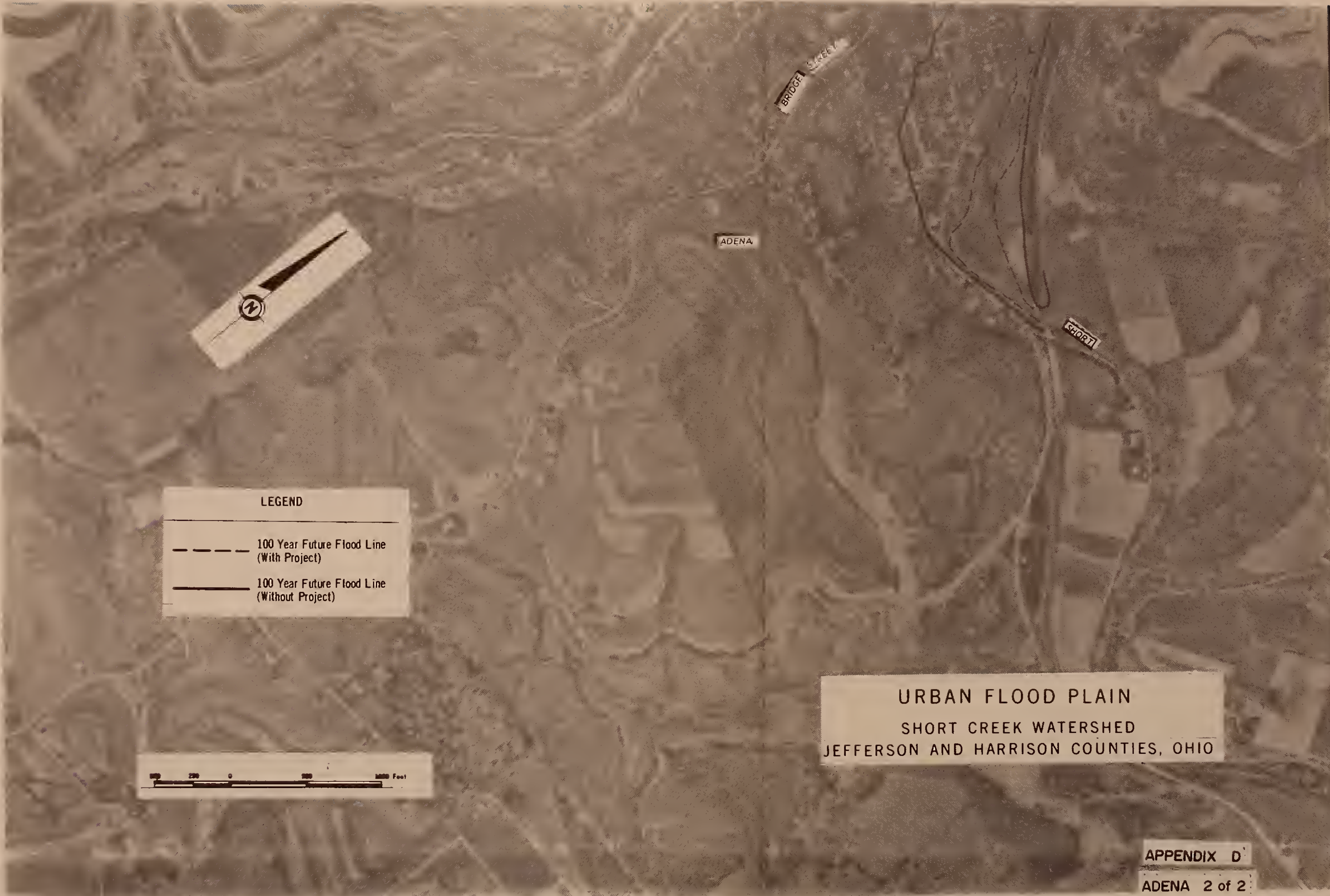
Approved by: Robert W. Wirgau
Robert W. Wirgau, AIP
Executive Director

RWW:B:bjg
3/13/73

APPENDIX D

Urban Flood Plain Maps


URBAN FLOOD PLAIN
SHORT CREEK WATERSHED
JEFFERSON AND HARRISON COUNTIES, OHIO
N
NORTH FORK
ADENA
SHORT CREEK
LEGEND
100 Year Future Flood Line (With Project)
100 Year Future Flood Line (Without Project)
MAIN STREET
BRIDGE STREET
BUCKEYE ST
500 250 0 500 1000 Feet
APPENDIX D
ADENA 1 of 2


BRIDGE
ADENA
SHORT
LEGEND
100 Year Future Flood Line (With Project)
100 Year Future Flood Line (Without Project)
URBAN FLOOD PLAIN
SHORT CREEK WATERSHED
JEFFERSON AND HARRISON COUNTIES, OHIO
APPENDIX D
ADENA 2 of 2

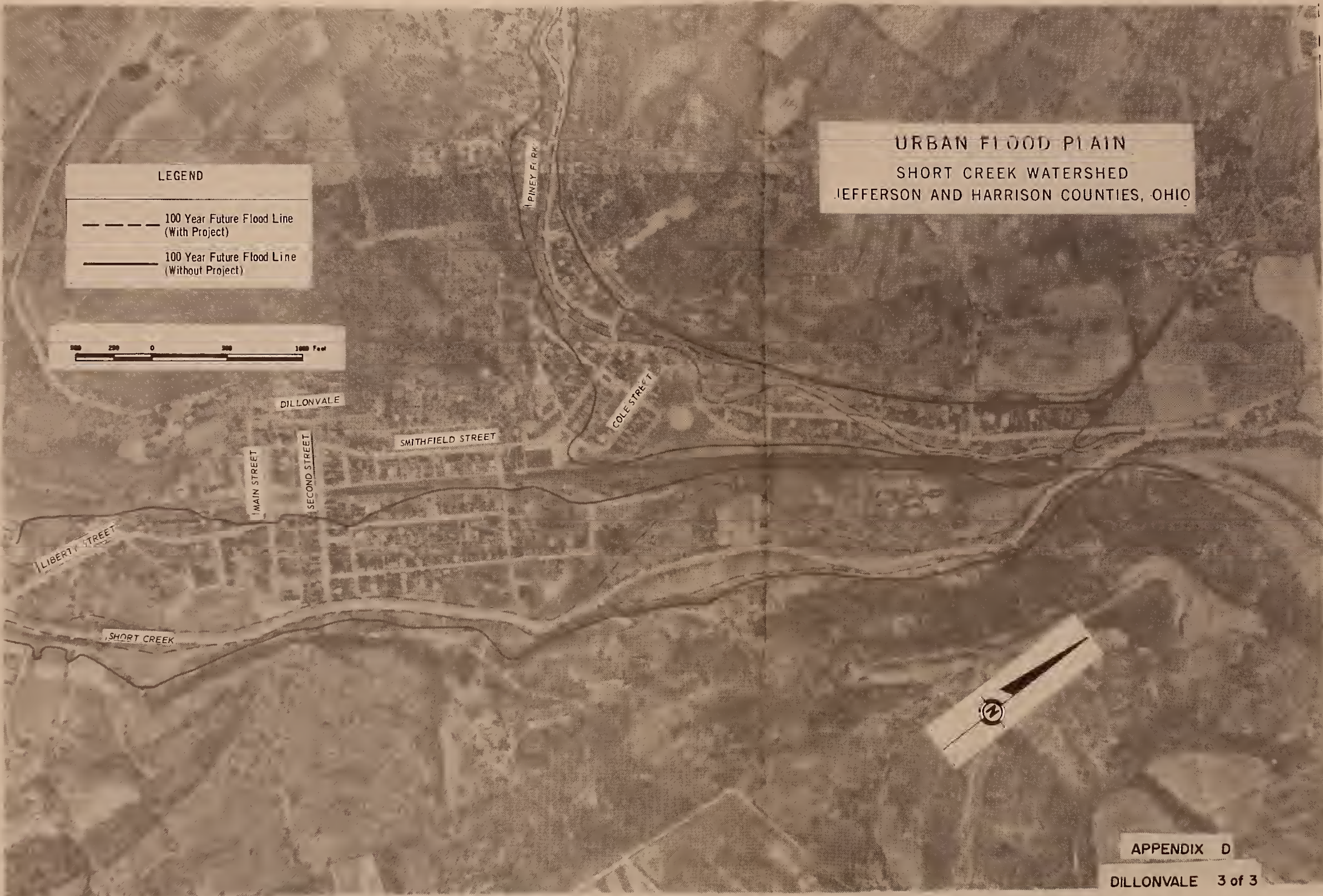

URBAN FLOOD PLAIN
SHORT CREEK WATERSHED
JEFFERSON AND HARRISON COUNTIES, OHIC
LEGEND
100 Year Future Flood Line (With Project)
100 Year Future Flood Line (Without Project)
N
SHORT CREEK
APPENDIX D
DILLONVALE 1 of 3

APPENDIX D

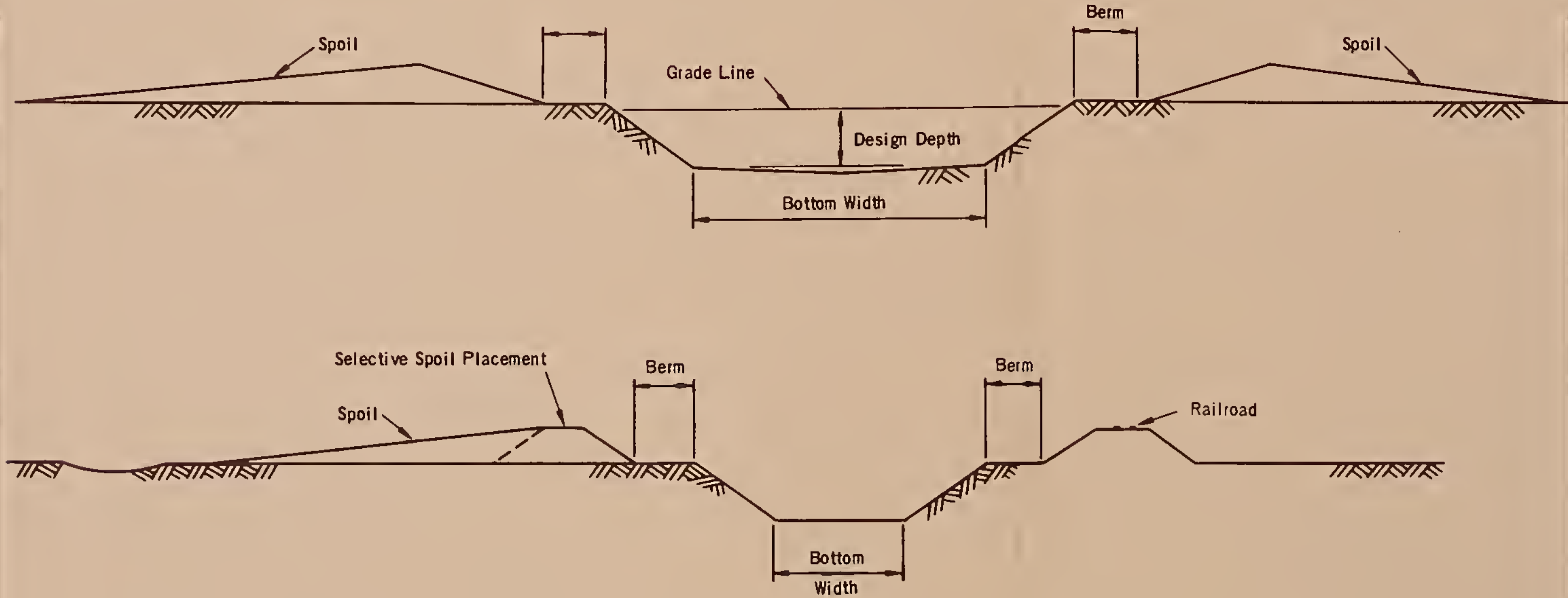
DILLONVALE 2 of 3

APPENDIX E

Profiles and Typical Cross Sections
for Channel Work



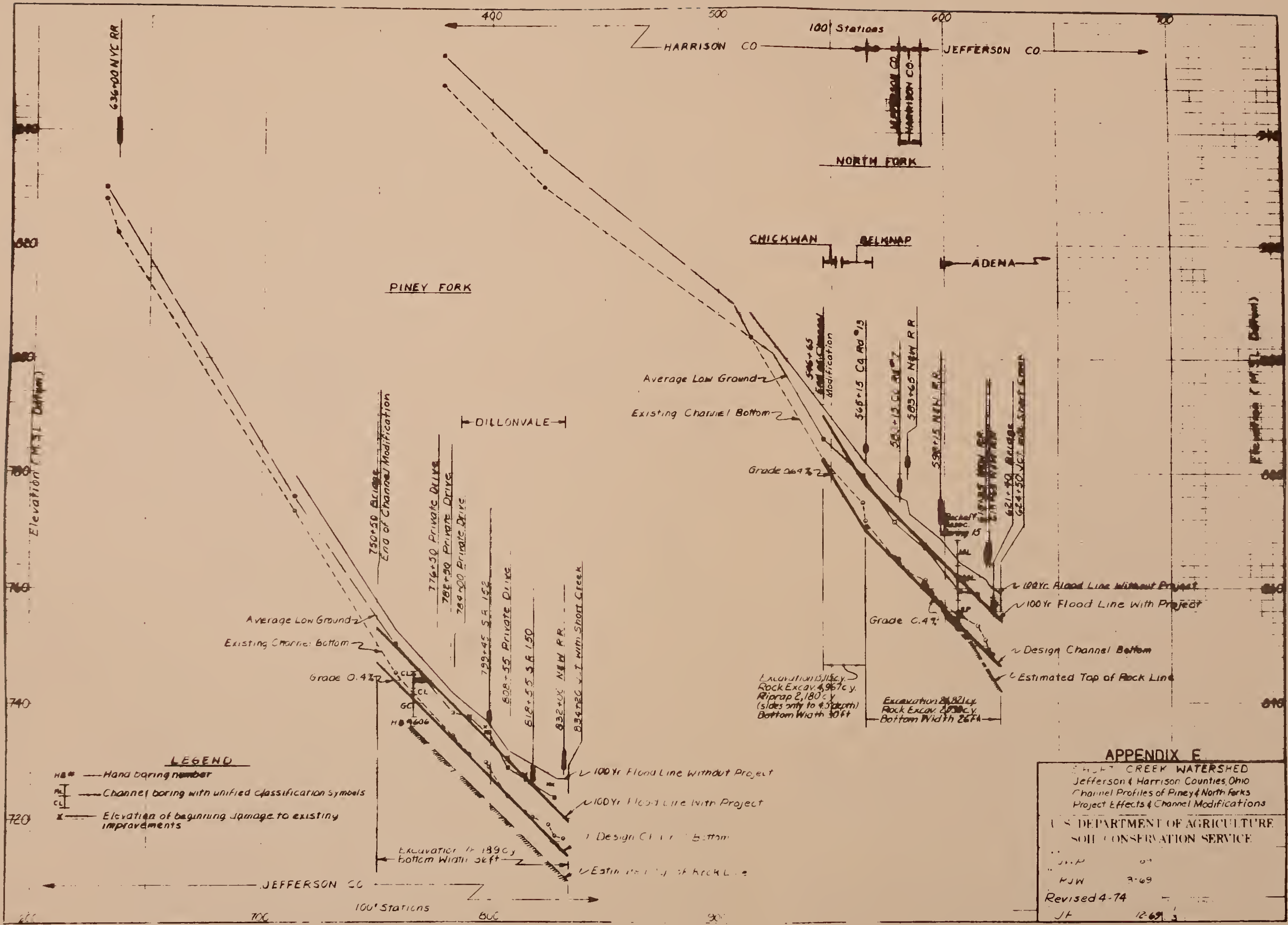
URBAN FLOOD PLAIN
SHORT CREEK WATERSHED
JEFFERSON AND HARRISON COUNTIES, OHIO
LEGEND
100 Year Future Flood Line (With Project)
100 Year Future Flood Line (Without Project)
0
1000 Feet
DILLONVALE
SMITHFIELD STREET
MAIN STREET
SECOND STREET
COLE STREET
PINEY FORK
LIBERTY STREET
SHORT CREEK
N
APPENDIX D
DILLONVALE 3 of 3



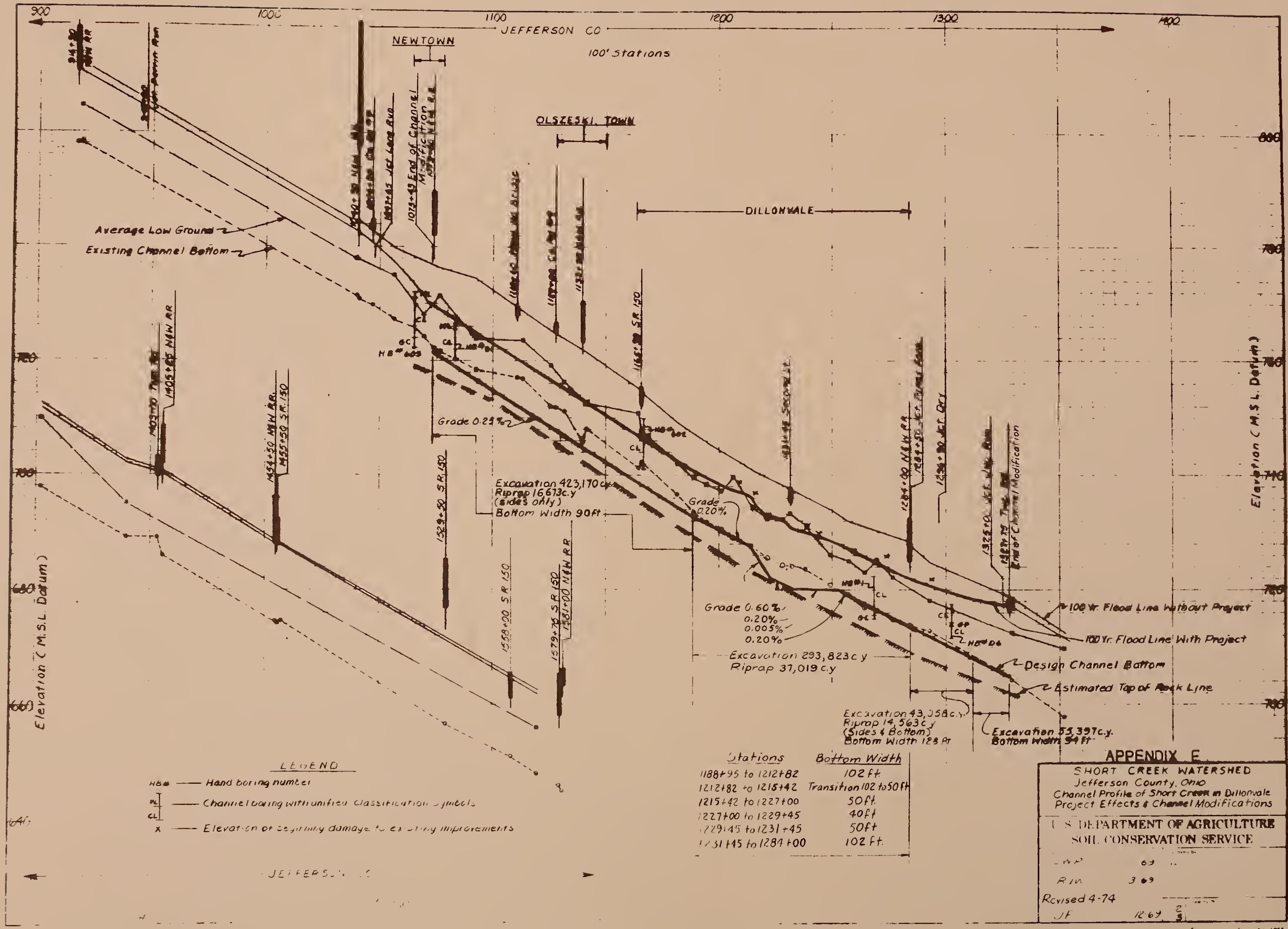
APPENDIX E

TYPICAL CHANNEL CROSS-SECTIONS
SHORT CREEK WATERSHED

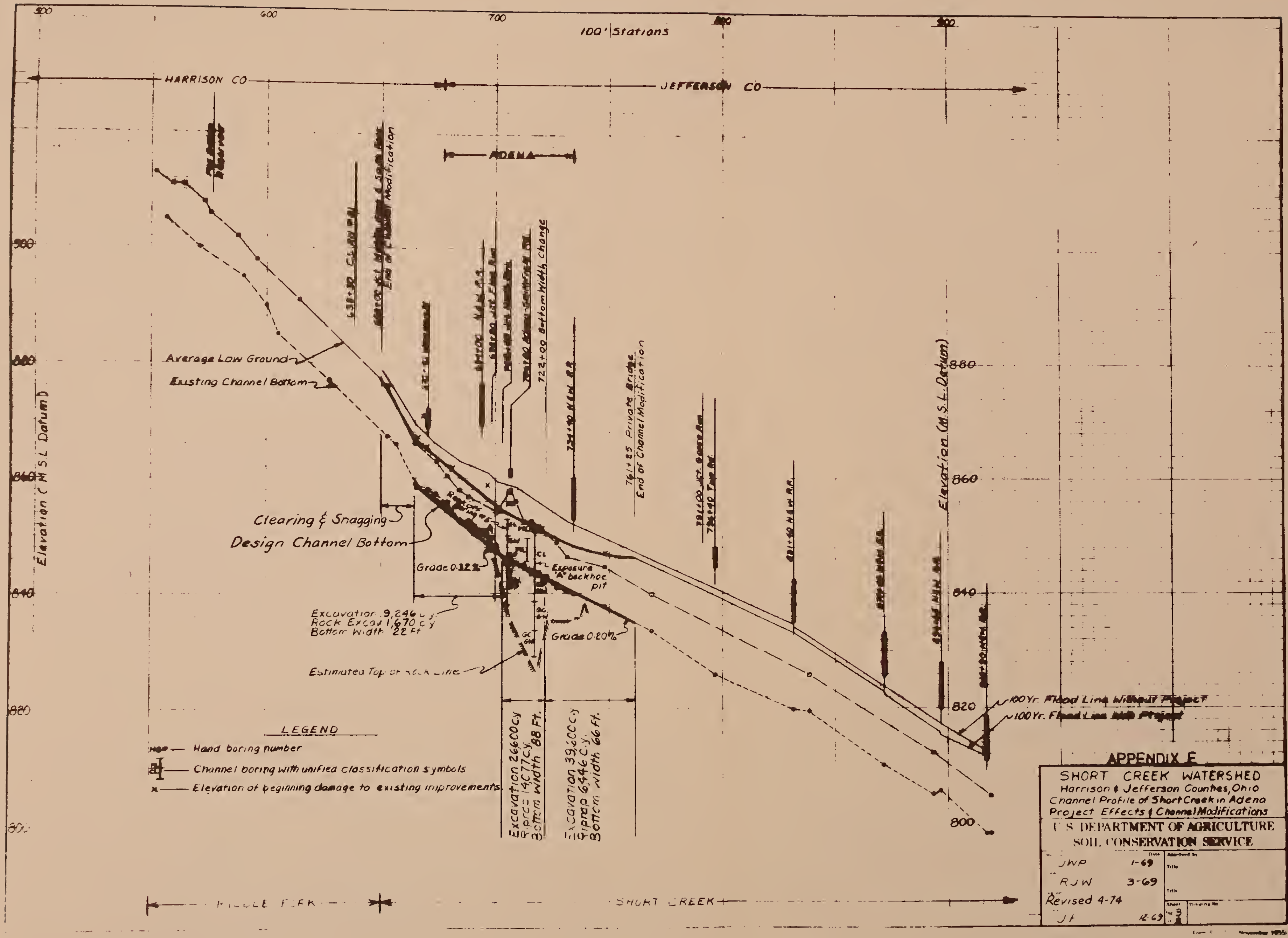
USDA-SCS-HYATTSVILLE, MD. 1970



HARRISON CO
JEFFERSON CO
100' Stations
NORTH FORK
CHICKWAN
BELKNAP
ADENA
PINEY FORK
DILLONVALE
636+00 NYC RR
Average Low Ground
Existing Channel Bottom
100 Yr Flood Line Without Project
100 Yr Flood Line With Project
Design Channel Bottom
Estimated Top of Rock Line
Grade 0.4%
Grade 0.4%
568+15 Co Rd #13
583+65 N&W RR
750+50 Bridge
End of Channel Modification
776+50 Private Drive
788+50 Private Drive
794+00 Private Drive
799+45 S.R. 152
808+55 Private Drive
818+55 S.R. 150
832+00 N&W RR
834+20 with Short Creek
Excavation 13,115 c.y.
Rock Excav. 4,967 c.y.
Riprap 2,180 c.y.
(sides only to 4.5' depth)
Bottom Width 30 ft
Bottom Width 26 ft
Bottom Width 36 ft
LEGEND
HB# Hand boring number
Channel boring with unified classification symbols
Elevation of beginning damage to existing improvements
Elevation (M.S.L. Datum)
APPENDIX E
SHORT CREEK WATERSHED
Jefferson & Harrison Counties, Ohio
Channel Profiles of Piney & North Forks
Project Effects & Channel Modifications
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
RJW 3-69
Revised 4-74
JF 12-69



JEFFERSON CO
100' Stations
900
1000
1100
1200
1300
1400
NEWTOWN
OLSZESKI TOWN
DILLONVALE
Average Low Ground
Existing Channel Bottom
1073+43 End of Channel Modification
Grade 0.25%
Excavation 423,170 c.y
Riprap 16,613 c.y
(sides only)
Bottom Width 90 Ft
1166+80 S.R. 150
1329+50 S.R. 150
1558+00 S.R. 150
1579+70 S.R. 150
1581+00 N&W R.R.
1454+50 N&W R.R.
1455+50 S.R. 150
1405+50 N&W R.R.
Grade 0.20%
Grade 0.60%
0.20%
0.005%
0.20%
Excavation 293,823 c.y
Riprap 37,019 c.y
1284+00 N&W R.R.
1325+0 End of Channel Modification
100 Yr. Flood Line Without Project
100 Yr. Flood Line With Project
Design Channel Bottom
Estimated Top of Rock Line
Excavation 43,058 c.y.
Riprap 14,563 c.y
(Sides & Bottom)
Bottom Width 123 Ft
Excavation 55,397 c.y.
Bottom Width 94 Ft
Elevation (M.S.L. Datum)
LEGEND
HB# — Hand boring number
— Channel boring with unified classification symbols
x — Elevation of beginning damage to existing improvements
Stations — Bottom Width
1188+95 to 1212+82 — 102 ft.
1212+82 to 1215+42 — Transition 102 to 50 ft
1215+42 to 1227+00 — 50 ft.
1227+00 to 1229+45 — 40 ft
1229+45 to 1231+45 — 50 ft.
1231+45 to 1284+00 — 102 Ft.
APPENDIX E
SHORT CREEK WATERSHED
Jefferson County, Ohio
Channel Profile of Short Creek in Dillonvale
Project Effects & Channel Modifications
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Revised 4-74
12-69


100' Stations
500
600
700
800
900
HARRISON CO
JEFFERSON CO
ADENA
Elevation (M.S.L. Datum)
880
860
840
820
800
Average Low Ground
Existing Channel Bottom
Clearing & Snagging
Design Channel Bottom
Grade 0.32%
Grade 0.20%
Exposure "A" backhoe pit
Excavation 9,246 c.y.
Rock Excav 1,670 c.y.
Bottom Width 22 Ft
Estimated Top of Rock Line
Excavation 26600 c.y.
Riprap 14,077 c.y.
Bottom Width 88 Ft.
Excavation 39,600 c.y.
Riprap 6,446 c.y.
Bottom Width 66 Ft.
723+00 Bottom Width Change
761+25 Private Bridge
End of Channel Modification
End of Channel Modification
100 Yr. Flood Line Without Project
100 Yr. Flood Line With Project
LEGEND
Hand boring number
Channel boring with unified classification symbols
Elevation of beginning damage to existing improvements
MIDDLE FORK
SHORT CREEK
APPENDIX E
SHORT CREEK WATERSHED
Harrison & Jefferson Counties, Ohio
Channel Profile of Short Creek in Adena
Project Effects & Channel Modifications
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
JWP 1-69
RJW 3-69
Revised 4-74
JF 12-69